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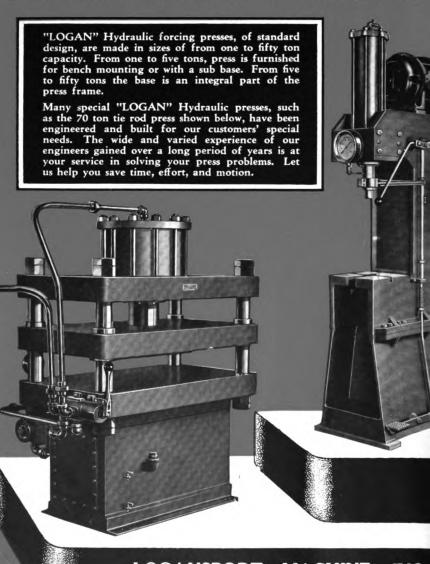
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HOWARD CAMPBELL, Editor

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CINCINNATI, OHIO

UNE, 1937

Vol. 10, No. 1

Manufacture of Automobile Frames Requires Heavy Equipment

Blanking Press Weighs 275,000 Pounds—Spot-Welder Makes 215
Welds in 21 Seconds.

BY HOWARD CAMPBELL

THE manufacture of the various members used in the construction of an automobile frame is interesting. not because of the complexity of the perations involved, but because of the unusual size of the equipment required for such work. A frame side member is a long piece of heavy steel, usually 0.187 in. thick and approximately 215 in. long. The latter feure varies, of course, with the different makes and types of cars. few inches more or less on the length. **leaver**, is of no consequence insofar **፡፡ the general capacity** of the manufacturing equipment and the amount www.required to operate it is waterned.

the operations involved in the building of an automobile frame include piercing the holes by which the several sections are riveted together and the running board and fender arms

are riveted in place, the forming of the sections to the desired contour and to the channel shape within is used to obtain as much strength as possible, the welding of certain sections and layers of steel in place also to give the frame extra strength—and the assembling of the side and cross members and running board and fender support irons.

The production of heavy sheet metal parts in the punch press is often so arranged that the punch press operations of blanking and forming come first, then the piercing, if any. In many cases this is the best procedure to follow, due to the fact that if the holes were pierced first, they would be in danger of being distorted during the forming operation. In the production of automobile frames at the plant of the Edward W. Budd Manfg. Co., Philadelphia, Pa.,

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however the operations are reversed, the members being blanked and pierced first and formed to shape afterward.

The blanking and piercing operations on the frame side members are performed in the huge press shown in Fig. 1. This machine is a Toledo Double Crank Single Action Straight Sided Press, double-geared, and with twin drive. It is equipped with a double die so that the left side members can be blanked and pierced in the die at the front of the machine simultaneous with blanking and piercing of the right side members in another die in the rear of the press. Two men work at the front and two at the rear.

This press is of unusual size, being 23 ft. 11 in. overall height from the top of the crown to the bottom of the bed. It is individually powered by a

60 h.p. motor with push button of trol, power being transmitted through an air-operated multiple disc frict clutch and brake. The press opera at a speed of 8 strokes per minute

The shaft in this machine is 11 in diameter. The friction genera by such a heavy shaft would be factor of no small importance we it not for the fact that Timken rol bearings are used on both the int mediate shaft and the flywheel; th the friction is reduced to the mi The slide is air-counter-b The equipment on this n anced. chine includes five box-type Marque cushions which exert 90 tons pressu cushions alone weigh 36.0 the complete pounds, and pre weighs 275,000 pounds.

As placed in the machine, the sta sheet is of the correct size and sha

to make one left a one right frame si member. The open tion of the pre blanks out two piece and at the same tin pierces 62 holes in t left blank and in the rig blank, the holes bei from 9/32 in. to 3/8 in diameter. The m chine makes approx mately 100 strok per hour, producing total of 200 member per hour.

In the next oper tion, illustrated Fig. 2, the blanks a

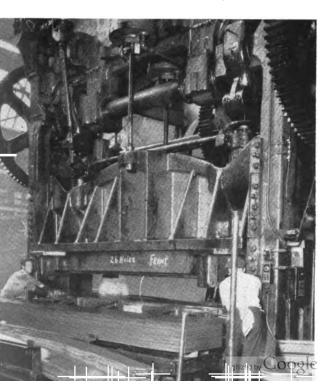


Fig. 1—Blanking a piercing the steel she which are later formed in automobile frame si members. This provelghs 275,000 pounds has a crankshaft 11 incl in diameter.



Fig. 2—Forming the frame side members to shape. One right and one left side member are formed simultaneously.

ment, where, in order to give the frame added strength, an extra thickness of steel is welded to of each member. The

the bottom face of each member. The welding operation is performed in the combined hydraulic press and spot welding machine shown in Fig. 3. The operation requires four operators; two at the front to place the frame members and steel strips in position on the machine, and two at the rear to remove the members after the operation has been completed.

In placing the side member in the machine, it is located on supports which are designed and arranged to support it at all points while the welding operation is in process. The

formed to the required shape. This operation is also performed on a Toiedo press, one right and one left side member being formed simultaneously. The illustration shows the operators at the rear of the press removing one of the members after it has been formed. The press is of the straight side type, with tierod frame. It is also double geared, with twin drive, and has a counterbalanced slide. The press has a 14-in. stroke, and will operate at a speed of 8 strokes per minute.

After forming, the frame members are conveyed to the welding depart-

Fig. 3—Combined hydraulic press and flash welding machine in which auxiliary steel strips are welded to the frame members to provide added strength. This machine makes 215 welds in 21 seconds.

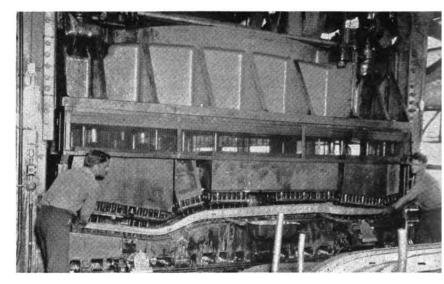


Fig. 4-Piercing a side frame member after the auxiliary strip has been welded to it.

auxiliary plate is then placed in position and power is applied. As the ram of the press descends, the frame and plate are gripped and held in exact alignment under a pressure of 100 tons while the welding operation is in process.

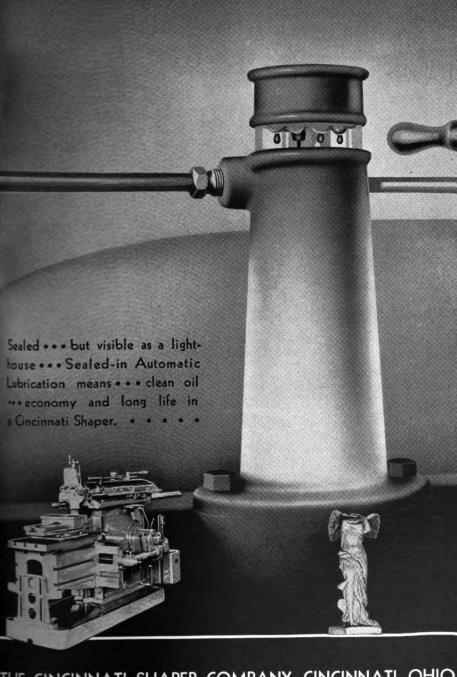
Pressure on the welding tips is obtained by individual hydraulic cylinders which are controlled by camoperated distributors that open and close the ports to these cylinders in synchronism with the operation of the electric timer. Current is applied through eight 100 k.v.a. transformers which are an integral part of the machine, each transformer energizing one of the eight tips which are in simultaneous contact with the frame member. The machine makes a total of 215 welds in 21 seconds, the total time for each piece, including the handling, being from 35 to 38 seconds. Average production on this operation is 100 pieces per hour.

The welding of the extra strip on

the side frame member necessitate an extra piercing operation in orde that the required number of hole may be provided. This operation iperformed in the huge press show in Fig. 4. The operators are show removing a frame member afte piercing.

The manner in which the right an left frame side members are assem bled together with the cross member is illustrated in Fig. 5. The work bench consists, in this case, of a hugcast iron plate, supported at the cor rect height from the floor to afford convenience in working. Locating blocks into which the side member are set provide for the accurate spac ing of the side pieces, and quick-act ing hand-lever clamps insure against any shifting of the members while the assembling operation is in process.

Inasmuch as the rivet holes in both the side and cross members have been provided for in the punch press oper-



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Fig. 5-Assembling the frame side and cross members.

ations, the task here consists in locating the cross members properly, slipping the rivets into place, and heading the rivets with the aid of the pneumatic riveting hammers which are suspended from monorails, by

INGENIOUS MECHANISMS FOR DE-SIGNERS AND INVENTORS—Volume II. Edited by Franklin D. Jones. 538 pages, 6x9 in.; 303 illustrations. Published by The Industrial Press, 140 Lafayette St., New York City. Price, \$5.00.

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Fig. 5—Assembling the frame side as cross members.



means o strong spring at strategi points over the bench. The springs hold the hammer up out of the way while the are at rest, yet the hammer can quickly brought in the play when the are needed.

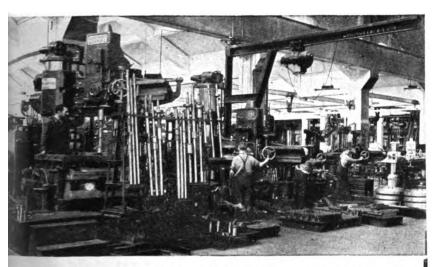
As the frames leave these work benches they pass on to similar iro tables where the spring hangers an running board supports are rivete on. They are then ready for ship ment to the automobile factories.

with Dwelling or Idle Periods, and Othe Special Lever Combinations; Feedin Mechanisms and Auxiliary Devices; Feeding and Ejecting Mechanisms for Powe Presses; Miscellaneous Mechanical Movements; and Valve Diagrams.

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SUPER-SERVICE RADIALS

Method of Polishing Holes in 75 mm. Recuperator Frames

By A. L. De Leeuw Consulting Engineer

In THE January, 1937, issue of "Modern Machine Shop" I described a quick method to determine whether the surface of the bores in the frame of the recoil mechanism was a true mirror surface. The method was interesting on account of the simplicity and speed with which these bores could be inspected. The method of generating these mirror-like surfaces is interesting, too, because it departed from the well established method the French were using and had been using for a number of years.

The French arsenals used the honing method, that is, they did the polishing with abrasive stones. These stones were of approximately the same curvature as the bore to be polished. They were held in a metal head and pressed outward by means of springs. In short, the construction of the honing tools resembled in all essentials the honing heads now used for the finishing of automobile cylinders.

These heads were attached to the end of a long bar—long, that is, as compared to the diameter of the holes, for these holes were 63 in. long and the largest was only about 2½ in. in diameter. The bar was attached to a cross-head, and this in turn to a connecting rod that received its motion from a crank with sufficient stroke to cause the stones to rub along the entire length of the bore. When the crank had made a complete turn, the bar with the head

would be indexed through a certa angle. Lubricant was pumped in the holes and the entire action w automatic until the hole was almo of the required size. After this poi had been reached the operation h came very laborious and required t greatest care and skill.

It would be found at the end of t automatic part of the operation th the holes were not entirely rour The vertical diameter would little larger than the horizontal or The workman would disconnect t indexing mechanism and change t position of the polishing head whi the machine was making its strok back and forward, until the hole w of the proper shape. Of course, was extremely difficult to obtain t correct shape of the hole and at the same time reach the correct diameter It should be kept in mind that the tolerance for the size of these hole was .0008 in.

Besides correcting the holes, t workman was supposed to do som thing else, equally laborious. He w supposed to make the ends of t holes of a slightly larger diamete. The length of the enlarged part the bore was only about two inches It would have been simple enough do this if the machine had been c pable of making a short stroke the beginning and the end of the hobut this was not the case. The m chines had no provision for shifti the crank pins, but even if they he this would not have helped. It would



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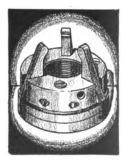
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then have been possible to get a short stroke, but this stroke would have been in the middle of the length of travel while the requirements of the case called for a short stroke at each end. The workman had to provide the motive power as well as the control for this part of the operation.

We had complete information as to the way the French constructed the recoil mechanism, and could have followed their methods, but I felt that it would be impossible to train men to do such delicate work in the short time available. Besides, it took an average of 36 hours for one hole, and, at the rate we were supposed to construct these machines, we would have needed 90 polishing machines of the French type, even if the work were going on 24 hours a day.

One of the arsenals was also engaged in the work of producing these recoil mechanisms. They followed the French method with some variations. The polishing machines were furnished by an American machine tool manufacturer. They looked more like machines than the home-made French product, but had the same essential features. They used abrasive stones that could be indexed, and had one additional feature that caused an additional trouble. The bar that carried the polishing head was guided in a jig eye close to the entrance of the hole. The result of this construction was that the axis of the hole was slightly bent and had to be cor-We can gather that this jig eye was made a feature of the machine on the general principle that jig eyes are good things, but a little thought should have shown the originator of this idea that the thing was very much out of place in this case.

At the beginning of the operation, there was just enough overhang of polishing head and bar to allow it to start into the hole. This overhang beyond the jig eye caused the bar to bend a very small amount. However when the polishing head was at the other end of the bore, the overhang and the consequent bending was much more, so that the head had the tendency to follow a curved path. Ir addition, this changing leverage of the weight of the polishing head did something else.

It was mentioned that the holes would be of oval shape if the French method were followed. This was caused by the fact that the polishing head was indexed. When the head was in the position where one stone was at the top and the other one at the bottom, there was a slight difference in the pressures at the top and the bottom due to the fact that ir the one case the pressure of the springs against the stones was hindered, and in the other case was helped, by the weight of the head and However, when the stones were at right angles to that position something else had to be considered The weight of head and bar caused the stones to wedge in the hole. More material would be removed per stroke than in the vertical position and the head would drop, which caused the cross section of the hole to be oval It is true that the amount of variation from the true circle was not great, but with a total tolerance as small as was the case here, even the smallest possible amount had to be considered. In any case, the fact that the hole had to be corrected for roundness when the French method was followed shows that this varying action of the head in its different positions was of practical importance.

If we now examine what the result must be of the method followed by the American arsenal, we find that the holes must be oval, that the shape of the oval—its eccentricity—is not the same at the beginning and the d of the hole, and that the axis of se hole is bent downward from be-

The importance of these factors was used before we started the operation of the machines that were emped for this work.

h these machines the polishing and had no other movement than tward and backward. The workice itself was indexed at the end of complete stroke. As a result, the tion of the tools was the same on part of the bore. There was no we tendency to wedge the tool into bore at one point than at another. here was no jig eye, and so the sag the head was the same along the tire length of the hole. Finally, machine was so constructed that short stroke could be had at any int of that length. At first it was sided to use the same kind of polhead as the French used, but before the operations bried, this idea was abandoned. It **s decided to use the lapping method** steed of honing.

The tool used for that purpose was thin cast iron cylindrical shell. It shell was sawed in at both ends, it saw slots being provided at each of the tool and placed so that a slots at one end came between the of the other end. This shell is mounted on an expanding arbor that a fractional turn of a nut adjust the diameter to correspond to the gradually increasing of the hole and also make up the wear of the tool itself.

Perty-five degree shallow helical poves were milled around the shell. We were two such helices, one that and one left hand. At the insection of these grooves, holes drilled through the shell and the were holes and grooves in the

arbor so that lubricant introduced into this arbor would flow out through the small holes at the intersections of the grooves. The head was fastened to a hollow bar and this bar, in its turn, was connected to the driving mechanism.

The driving mechanism consisted of a screw with large lead, 3½ in., directly connected to the driving motor. The motor was of relatively low speed and was reversible. The control of the motor allowed for a reversal in a fraction of a single revolution, so that a stroke of as little as two inches was readily obtainable. Dogs placed along the path of the bar took care of the reversal and by placing them at the proper points a short stroke could be had anywhere along the length of the hole. These same dogs also took care of the tripping of the indexing mechanism. The machine was quite simple and took up a minimum of space. A pump provided an ample stream of lubricant charged with a fine abrasive.

The machine required no particular skill to operate. The nut of the expanding arbor had to be adjusted from time to time until the proper diameter was obtained. The stroke was then shortened for one end of the hole and later for the other end. few of these short strokes were required for the desired amount of bellmouthing. The total time required for one hole was from two and onehalf to three hours. The amount of metal removed was from 0.0025 to 0.003 inch. All holes showed an accuracy far greater than what was demanded. They all came to within 0.00025 in., whereas the tolerance was 0.0008 in.

When these holes were finished by this method it was found that one requirement was not met. The surface was dull, though very smooth

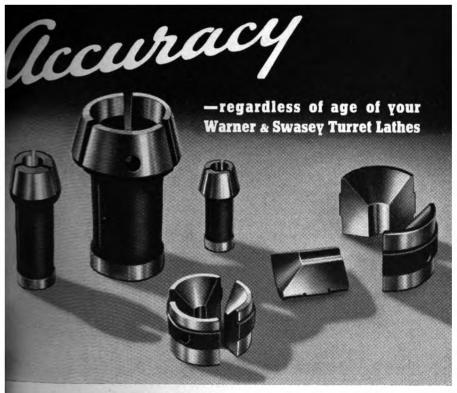
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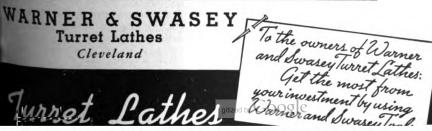


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General Instructions for Sharp ening Milling Cutters

BY JOHN ELFRING
Chief Tool Designer, Cincinnati Milling Machine Company

THE following data was compiled for the guidance of the operators in the cutter maintenance department of the Cincinnati Milling Machine Company, and was later issued in folder form for the use of the sales engineers. So many requests have been received for copies of these instructions that the information is released here for the use of industry in general. The data is of a general nature, applicable to any cutter sharpening problem.

Any cutting tool should have the smallest possible clearance angles (indicated at A and B in the drawing), and still not have any portion of the tool behind the cutting edge drag on the finished surface. This condition assures the maximum support for the cutting edge and leaves more metal for the dissipation of heat. The proper clearance angles of a milling cutter depend upon the speed, feed, depth of cut, hardness of the material, and rigidity of the work-piece and set-up.

New cutters received from the tool manufacturers are usually ground with about 5 deg. clearance on the periphery of the teeth, and from 2 deg. to 5 deg. on the end or sides of the teeth. These clearance angles are suitable for general purpose cutters. However, best results can be obtained only by varying the clearance to suit the conditions described in the preceding paragraph.

Knowing the material from which

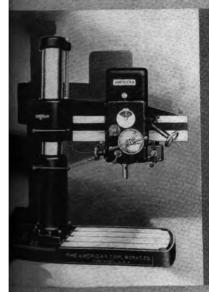
the work-piece is made, a good ge eral rule for the primary clearan on the periphery of the teeth is 3 de for steel, 7 deg. for cast iron, and deg. for aluminum and brass. T harder the material, the smaller t clearance angle should be. The se ondary clearance should be about deg. more than the primary. To d termine the proper clearance by tri start with the angles mentioned, a at each grind decrease the angle 1 deg. until the heel of the prima land drags. Then increase the ang 1 deg. to obtain the most efficient cu ting conditions.

The width of primary land back the cutting edge, indicated at D the drawing, should not exceed 1/in. for light cuts, or 1/16 in. for hea cuts. The primary clearance can checked with a protractor or dial dicator. A good rule to keep in mi is that for a 1/16 in. of land, 1 do of clearance is equal to 0.001 in. the dial indicator. The diameter the cutter has no effect on this measurement.

A milling cutter with more prima clearance than is necessary will have a tendency to chatter, causing a cutting edge to break down, and consequently increasing the number sharpenings necessary to keep cutting edge in proper condition. It same thing is true, to a lesser extermation of the control of the control of the cause of most poor is is not milled surfaces.

A poorly sharpened cutter increase

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TOOL WORKS COMPANY

the cost of milling in several ways. First, the cost of sharpening is increased, because the cutter must be sent to the tool maintenance man for re-grinding more often than would

Cutters or gangs used for a particular work-piece or family of partican be ground to the exact clearance angle for the most efficient cutting by trial and error, as described in the

						M	7	CL	EARA	NCE (ON N	EW CUTTER
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B C D	MILD CAST APRO TOO I STEEL CAST GENER	RAPII IRO	EL 5° N 7° ATELY DLY V	30° 01		BRASS IC)*	RY LA	ND V	WILL	NOT	INCREASE
B C D	MILD CAST APRO TOO I STEEL CAST GENER	RAPII IRO	N 7' ATELY DLY V	30° OI	SHA	BRASS IC	P SO PRIMAP					
B C D	MILD CAST APRO TOO I STEEL CAST GENER	RAPII IRO	N 7' ATELY DLY V	30° OI	SHA	BRASS IC	P SO PRIMAP					
B C D	MILD CAST APRO TOO I STEEL CAST GENER	RAPII IRO	N 7' ATELY DLY V	30° OI	SHA	BRASS IC	P SO PRIMAP					
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B C D	MILD CAST APRO TOO I STEEL CAST GENER	RAPII IRO	N 7' ATELY DLY V	30° OI	SHA	BRASS IC	P SO PRIMAP					
B C D	MILD CAST APRO TOO I STEEL CAST GENER	RAPII IRO	N 7' ATELY DLY V	30° OI	SHA	BRASS IC	P SO PRIMAP					

preceding para, For ex graphs. ample, a thread milling cutted used on steel and run at 🛊 relatively slow feed rate, should be ground with very little clear ance. Saws an slotting cutter are in somewhat the same class.

General pur pose cutters should be ground for the kind of material on which the cutter is to be used, adhering established standard clear. ance angles from different types of cutters such as face mills, spira mills, end mills thread milling cutters and S Relatively small diameter cutters can b given a smalle clearance angle

otherwise be necessary. Second, the life of the cutter is shorter, since the useful life is directly proportional to the number of grinds necessary to keep the cutter sharp and in good condition. Third, time is wasted in replacing a dull cutter with a sharp one. Last, there will probably be a greater proportion of inferior milled surfaces rejected by the inspection department.

as the feed is usually reduced in proportion to the size of the cutter.

The method used in the C. M. M. Company's shop to assure the correct clearance angles on the cutter is shown in the two sketches. Notice that angles A, B, and C, and land D are definitely specified for general purpose cutters. If the cutter is to be used for one particular job, it is numbered and listed in the space provided



along with exact figures for A, B, and D. as determined by trial and error. In this manner the personal judgment of the cutter grinder operator is eliminated, assuring a uniform quality of finish and the most efficient cutting conditions. Whenever an entry is made on the shop print of the drawing, the tool design department is notified and they also make the same entry on the master drawing.

Thus the shop efficiency is raised, and at the same time a valuable written record is available for future use.

Polishing Holes in 75 mm. Recuperator Frames

(Continued from page 73)

The mirror finish was lacking. order to obtain this finish, the lapping head was removed and the old honing head substituted. However, the original abrasive stones were not used. Instead, pieces of water-of-Ayre stone were used. These stones produced the desired finish in half an hour or less, and, although they changed the nature of the surface, they did not remove an amount of metal that could be measured with the instruments at The total time from floor to floor for one hole was from three to three and a half hours, and this time was so much better than the best that could be obtained by the French method that no night work was required, though only twelve of these machines were built.

More than sixteen hundred holes were treated this way, without a single failure.

New Lightweight Freight Cars Pass Grueling Tests

IN THE new all-welded, low-alloy steel box cars built by the Pull-I steel box cars built by the Pullman-Standard Car Manufacturing Company, designers have obtained

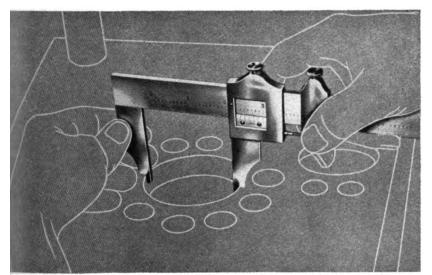
just about the ultimate in lightweigh construction.

To prove that the saving in weigh of 10,000 to 13,000 pounds per car obtained at no sacrifice in safety, or of the new cars was subjected to series of severe tests under the au pices of the Association of America Railroads. A standard car and ne car were each loaded with sand bag to rated capacity, after which th standard car was rolled into the ligh weight car at various increasing speeds. In order to study just wha happened at impact, slow-motion pictures were taken of each tes Through increased loadings, the struc ture was tested to its full limit.

Results of the test showed th ability of the new cars to stand u until 220 per cent of the calculate maximum safe load had been applied thus proving once again that th greater pay-load capacity of the new lightweight freight cars has not bee obtained at the expense of safety.

Abrasive Grinding Wheel Data Bool Abrasive Company, Division of Simond Saw & Steel Company, Tacony & Pra ley Sts., Philadelphia, Pa., is now is suing a 112-page book in which a wealt of grinding wheel data is contained Such subjects as the modern grindin wheel, types of cutting particles, type of bonding mediums, tool and cutte grinding, internal grinding, snaggin wheels, knife grinding, abrasive polish ing grains, and grinding wheel dresser are discussed in an interesting manner

The book explains how the use of modern grinding wheels has been extended from grinding comparatively fer metals to practically all metals as well and the state of the state non-metallic materials of endles Grinding wheels of differen types of abrasives have been developed to efficiently grind this wide range o materials. In general, Borolon is used for grinding steel, steel alloys, annealed malleables and similar materials of high tensile strength, and Electrolon is used for grinding materials of low tensile strength, such as cast iron, unannealed malleables, brass, bronze, aluminum tungsten carbides, stone glass, porcelain synthetic resins, horn, pearl, rubber, and so on. Copy free upon request.









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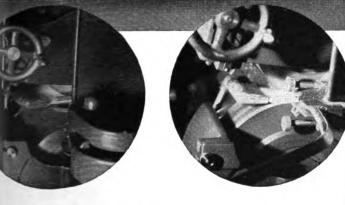
ductivity of machines and improved Year after year, in many plants under a variety of operating conditions, Sunoco has increased the pro-

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Operation: Enjahed Grind Large Diameters

Operation: Grinding Piston

Machine: No. 2 Cincinnati Centerless Grinder Material: Hardened Steel Production: 28 perminute Coalant: 1 part Sunoco—



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Hydraulic Power and Its Applications to Modern Industry, IV

Hydraulic Accumulators and Intensifiers—Modern Hydraulic Pumping Equipment—Hydraulic Control of Machine Tools

BY WALTER L. TANN,

Hydraulic Engineer, Farrel-Birmingham Company, Ansonia, Conn.

AVING scanned the field of press construction and application let us consider the methods by which hydraulic power may be produced. To go back to the fundamental hydraulic press, we find that such presses are

Fig. 22—Photograph of a radial piston pump corresponding to the drawing shown in Fig. 23.

usually installed in batteries or groups when used on regular production. Particularly in the industries working on plastic materials, the hydraulic accumulator is the logical means of supplying high pressure water.

An accumulator in its simplest form consists essentially of a verti-

cal hydraulic cylinder, containing ram or plunger. To the top of the ram or plunger is attached a suitable structure from which can be suspended weight of some nature. This weight may consist of cast iron

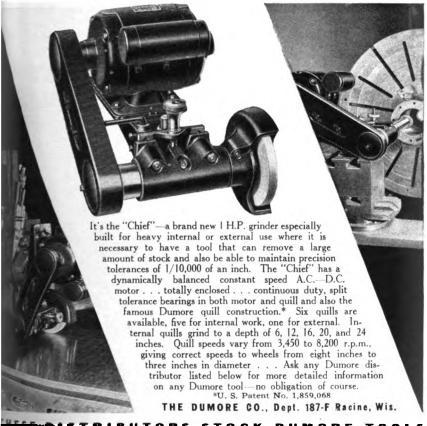
blocks or segments cast in regular shape, or scrap iron, scrap steel, punchings, sand, or some other weighty material contained in a cylindrical container. No matter what the form so long as it will contain sufficient weight.

The hydraulic cylinder has two orifices or openings, one from the pump, the other to the press or other hydraulic unit which it is to supply. The pump supplying the accumulator is usually of the motor-driven triplex type and is controlled by the rise or fall of the accumulator ram to which is attached

the weights or weight tank. With the ram down, the circuit is closed by the limit switch which starts the pump causing the ram to rise.

As the cylinder fills, the ram approaches the top limit of its travel and opens the pump circuit by means of another limit switch, thus shutting off the pump. The water in the cylin-

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der is then acted upon by the weights, through the ram, producing a pressure or head on the water, which is withdrawn from the accumulator by the use of the presses. As the water is withdrawn, the weighted ram descends in ratio to the displace-

ment of the presses in operation, and the pump again starts, repeating the cycle. Again we see the application of Pascal's law in the pro-

Fig. 23—Drawing of the Radial-Type Piston Pump shown in Fig. 22.

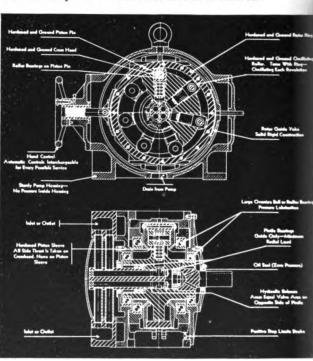
duction of hydraulic pressure by the weights acting on the accumulator ram of a certain area.

Thus it is possible to serve a number of hydraulic presses

from one accumulator, assuring an even supply of high pressure water. Engineering judgment must, of course, be used in the determination of the average and maximum water demands on the accumulator and the proper size of pump and accumulator. These can only be determined after a careful study of the operating cycles of the presses composing the group to be served.

The weighted type of accumulator described in the foregoing is the one in most common use, but the air-

loaded type is sometimes used when lighter weight is necessary, such a when located on upper floors of fac tory buildings. It also has the ad ditional advantage of being able to operate in a horizontal position when headroom is limited.



The principle is the same as in th weighted type, except that air-pres sure acts on a piston rigidly connected to the accumulator ram. Th required air pressure is supplied by a motor driven compressor delivering air at 175 or 200 lbs. per sq. in but if other air supply is available the accumulator compressor may be dispensed with. The only air actuall required during operation is to replace that lost by leakage.

Due to adiabatic expansion of th air, the air pressure will vary fo

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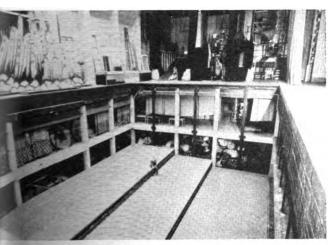


Fig. 24—View of the Radio City Music Hall stage showing the stage elevators lowered at various levels below the stage floor.

various displacements of the ram, so that true uniformity of pressure cannot be obtained from the hydro-pneumatic accumulator, but for most applications the variation is of no consequence. An air expansion tank connected to the air cylinder will compensate for a reasonable degree of this expansion-pressure loss.

Another method of producing high hydraulic pressure is by means of the intensifier, which consists of two opposed hydraulic cylinders of different diameters with a plunger of two diameters working in them. Low pressure water is admitted first to the large cylinder and is then intensified in the smaller diameter cylinder to the required high pressure. Again the

quired high pressure. Again the fundamental law of Pascal's is at work. A variation of this hydraulic intensifier is the steam-hydraulic intensifier described in connection with forging presses.

Modern Hydraulic Pumping Equipment

For successful operation of the high production presses used in metal-forming work, the self-contained pumping unit is essential; without the modern pump and its con-

trol the highspeed press would not be a reality. At the present time there are three types of pumps available to press designers, each of which is best suited to certain definite

duty and pressures. First, is the gear pump; second, the vane type pump; third, the rotary radial piston pump.

As this last type, with its infinitely variable and reversible discharge, has made the high pressure high speed press possible, we will devote a little time to an examination of its operation. There are some four or five makes, all fundamentally the same, but varying in construction details.

In general, a pump of this type consists of a cylinder body fitted with radial plungers. The cylinder body is free to rotate—carrying the plunger with it—within the floating ring, which is capable of moving from right to left and vice versa. The distance that the floating ring is off the center of rotation of the cylinder body is called the "stroke" of the pump. If it is on the same center, the pump is on "neutral" and results in a minimum discharge of oil.

Increasing the "stroke", that is, increasing the distance from the center of the cylinder body to the center of the floating ring, increases the volumetric discharge of the pump. Shift-

ing the floating ring past the center of the cylinder body to the other side of the vertical center line reverses the suction and discharge.

Thus we see that variable rate of discharge can be obtained from a constant speed motor drive and with proper inbuilt control on the pump,

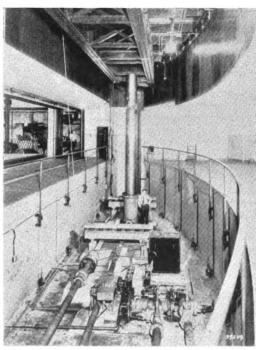


Fig. 25—Some of the hydraulic equipment which operates the orchestra elevator in Radio City Music Hall. Note the cylinder and rams, also the equalizing mechanism and control valves.

pressure regulation can be obtained entirely automatically, from zero to maximum, with a constant speed of the prime mover.

The rotary radial piston pump is, of course, an ideal hydraulic power unit and as applied to hydraulic presses, is usually equipped with a type of regulator that permits of discharge from one flange on one side

of the pump only, giving a maximum pressure limitation from that side. The pressure range can be easil changed by the manual operation of the regulator handwheel, or a pilot operated stroke-regulator can be employed.

The use of rotary radial pisto

pumps on hydraulic presse is comparatively recent, bu rotary variable stroke pisto pumps have been used sinc about 1906, chiefly on mili tary and naval equipment Its use in these connection was in conjunction with hydraulic motor, built mucl the same as the pump excep that the stroke of the moto is fixed at a maximum while the stroke of the pump i variable. The combination of pump and motor forming hydraulic transmission is standard unit in our Navy or boat and airplane cranes windlasses and boat winches

Practically every nava vessel built within the last 15 years, as well as scores of merchantmen, use the rotary piston pump for the operation of the steering gear. When the wheel is turned in the wheel house, its position is transmitted by telemotor or by Selsyn transmitter to a floating lever or Selsyn receiver, which operates to put a reversible dis-

charge radial piston or stroke in the direction subject to the direction the wheel was turned. Oil is drawn from one cylinder of the hydraulic steering gear and discharged to the other, thus causing displacement of the rams. This ram movement is transferred from the rams to the rudder stock and the rudder is turned. There are some intermediate safety





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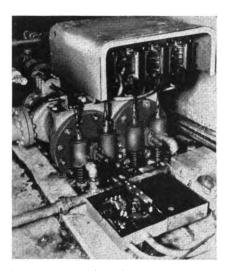


Fig. 26—View of the hydraulic valves for the stage elevators at Radio City Music Hall. Each pair of rams on which a stage section is supported is governed by main inlet and discharge valves. The four solenoids which control the inlet and discharge sides are seen at the top front. In the lower left is the Selsyn follow motor which responds to the speed setting on the stage control panel and regulates the port opening. In the rear are Selsyns which operate he auxiliary valves and do the automatic inching for precise leveling.

devices, but substantially the working of a hydraulic steering gear is as described.

The use and application of these variable stroke pumps and transmissions in general industry is growing constantly and they fill a long vacant place in the hydraulic designer's field.

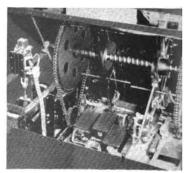
Turning now for a moment from the strictly industrial phase of hydraulics we find that the entire stage and also the orchestra pit in Radio City Music Hall, New York, are movable by means of a mechanism in which the plunger and cylinder principle is utilized. There we find an orchestra elevator 70 feet long by 16 feet wide, and three stage elevators of the same general dimensions. The travel of the orchestra lift is about

30 feet and that of the stage l 42 feet.

This installation is of the pressure" type, using 20-in. dis plungers and 250 lbs. per sq. in. ing pressure. Each elevator (has two plungers, with an automechanical equalizer to cause the plungers to always travel a same rate. Pressure is provided two centrifugal pumps worthrough an air-loaded accums system.

Control of the elevator syst effected by Selsyn transmitter receivers, operating the pile trolled main operating valves. interesting feature of the insta is that it is possible to spot the elevators within ½ in their 40 feet of travel. The

Fig. 27—The leveling control for th lifts. When the stage elevating open initiated at the stage control board, we shown in figure 28, a small motor rots sprocket wheel at the left and a Selsy mitter is connected to it. The center life is meanwhile advanced along the square shaft until it occupies a position correst to the desired level of the stage section Selsyn motor or "follow" on the control has meanwhile registered the preset lor indication. When the stage section is up or down, the right sprockets move transmitting motion to the central right tact wheel. When this wheel strikes the location of the central left wheel, the lic valves are actuated and stop the control left wheel, the lic valves are automatically broughly to obtain the precise level. In fac inching valves are always in circuit: stage "breathes."



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PORTABLE ELECTRIC TOOLS

94

self-levelling. Also interesting is the fact that one edge of the 70-foot platform will level within 1/32 in. of the opposite end, 70 feet away.

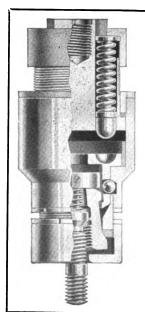
Although the rotary radial piston pump with its wide pressure and delivery variation is used extensively on industrial hydraulic applications, it is by no means used exclusively. There are several types of rotary pumps of the balanced vane and gear types that are used satisfactorily for constant pressure discharge work. Rotary vane pumps are built in the double stage type that are capable of discharge pressures up to two thousand pounds per square inch.

Pumps of this general type are much less expensive than the radial piston pumps, and are highly efficient. Many small presses are equipped with pumps of this type, operating at pressure of 1,000 lbs. per sq. in. if of the single-stage type or at 2,000 pounds if double-stage.

Hydraulic Control of Machine Tool

The chief application of pumps of these types, however, has been in the machine tool field. Tremendous for ward strides in this field have been made within the last few years at the design improvement in pumps have compact pump of known characters tics, the hydraulic designers have evolved control systems that materially possible the achievement of a smooth ness of feed and speed control have force unavailable in gear-operations.

Let us examine briefly the hydral operating equipment on several cently developed machine tools. an example of a variable hydral feed we will take a recent design a surface grinding machine with ble traverse, cross feed for the whead, and wheel truing all control hydraulically. A gear-type oil put



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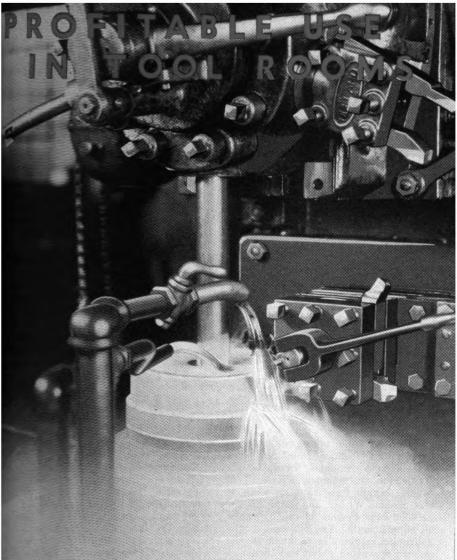
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A BATTERY OF VERTICAL TURRET LATHES IS USED CONSTANTLY IN THE TOOL ROOM OF THE BULLARD COMPANY, FOR FAST ACCURATE MACHINING OF ODD JOB WORK SUCH AS JIGS, FIXTURES, ETC. EASE OF CHANGE-OVER FROM JOB TO JOB, EXTREME RIGIDITY, MACHINING TO DECIMAL LIMITS, AND FULLEST USE OF MODERN CUTTING TOOLS MINIMIZES IDLE TIME AND INCREASES RESULTANT SAVINGS —

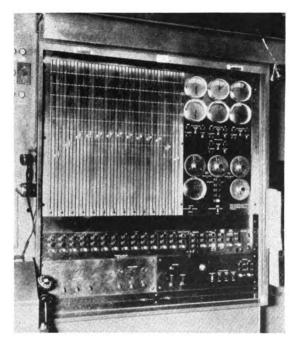


Fig. 28-This view shows the control board on the stage tha governs the movements of the elevators, the revolving stag and the graceful contour cur tain. At the extreme uppe uppe right are seen the three heigh indicators which indicate the height of the stage lifts in fee and eighth-inches. Next below are the preset dials for each section. These dials are used to operate the Selsyns on the valve in the pit. Next below are the speed indicators which regulate the openings in the ports the hydraulic valves. Thes speed indicators may all thre be interlocked or may be oper ated individually. At the left the control for the famous con tour curtain. This control is no tour curtain. This control is no operated hydraulically, but by thirteen individual two horse power motors driving thirtees hoist cables attached to the bot tom of the curtain. The white buttons on the control board in dicate the position of the limit switches which govern the trave of each separate hoist motor. A gang button will operate the thirteen motors simultaneously or they may be operated individually.

is used for the generation of hydraulic pressure, driven by an electric motor.

This hydraulic power unit is so mounted on vibration isolating blocks that any detrimental virbration is kept from the grinder, which is, of course, highly important on tools of this class. Within the base of the grinder base casting is the hydraulic oil supply tank. The oil used as the hydraulic medium is pumped to the master operating valve and then distributed to the wheel head and table operating cylinders. Pressure lubrication of the work table is effected by a valve in the hydraulic system.

At each automatic reversal of the work table, an automatic hydraulic feed moves the wheel head from 1/32 to ½ in., depending on the desired feed adjustment. Table travel speed is at a rate up to 100 ft. per min. and is adjustable at the will of the

set-up man or operator. Rapid traverse is also accomplished hydraulically, at a wheel head speed of 20 ft. per min. A slow continuous feed is used for wheel truing.

The grinder feed system just described is comparatively simple but illustrates the method used in the substitution of hydraulic feed for the older and less flexible mechanical feed. On larger machine tools for heavy duty, the hydraulic feeds are necessarily more rugged and complicated.

On a recent design of planer, both the table and crossfeed are operated hydraulically. Constant pressure and constant delivery are maintained in the hydraulic system, with resulting constant feed-pressure and cutting speed throughout the power stroke. The power stroke cutting speed and the reversal or traverse speed are independent of each other.



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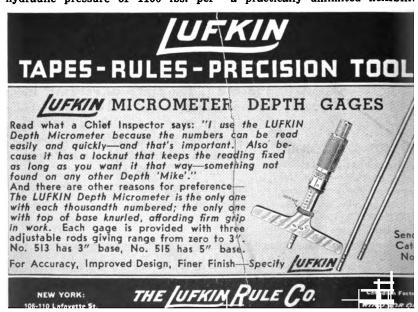
A rotary radial piston pump, motor driven, supplies oil to the table and cross-feed cylinders at a pressure of 1100 lbs. per sq. in. The pump contains a built-in constant pressure valve with external adjustments providing for accurate setting of cutting and return speeds. This valve, automatically controlled by the maximum pressure built up in the hydraulic system, builds up an additional resistance in the return line during the cutting stroke of the table that acts as a "cushion" and prevents "surging" of the table during spaced or intermittent cuts.

The actual control of the planer is incorporated in an operating valve containing inching and reversing valves. Adjustable table dogs operate a pilot valve, actuating in turn the reversing valve. The cross-feed is operated from the same hydraulic circuit and of course at the same hydraulic pressure of 1100 lbs. per

sq. in. The cross-feed cylinder erates an overrunning clutch, reing a vertical shaft in one directionly. The amount of feed per a work-stroke is controlled by a crometer adjustment which is a of the work-table piston.

The same general application of draulic feed and speed control is found on production milling mach broaching machines, metal a cylindrical grinders and various of types of machine tools. Com hydraulic control has recently applied to a gear-grinder with table, wheel-spindle ram, inde automatic knock-off and even ar filter all operated by hydraulic por Two separate although interlucircuits are used with a con pump and oil tank serving both

Summing up the case of hydr feed and speed control for ma tools, we find the advantages t a practically unlimited flexibility





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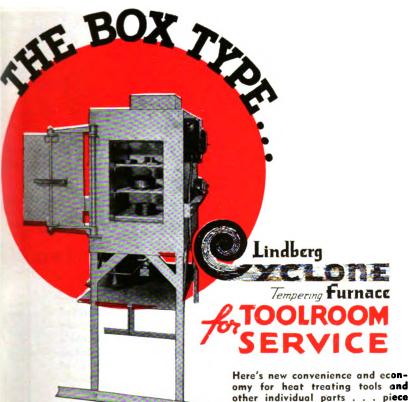
control with a minimum of adjustment and shifting of controls. An infinite variety of feeds or speeds can be obtained by the simple manipulation of a dial, while with mechanical feeds we have the necessity for gear shifting and at the best are able to obtain only a limited variation.

Other advantages are quietness of operation and freedom from the shock of reversing heavy loads. These features alone are resulting in reduced machine tool maintenance costs in plants where executives have been "sold" on the idea of hydraulic control.

Constant improvement is being made by machining tool builders and by the hydraulic equipment manufacturers, and the day is not far distant when the plant without tools incorporating hydraulic operation of some of their functions will be in the minority.

Severance Midget Milling Cutters—Ground from the Solid After Hardening—are presented in a 12-page catalog now being issued by Severance Tool Manufacturing Co., 1514 E. Genessee Ave.. Saginaw, Mich. Severance Midget Milling Cutters are now made in a wide variety of practical shapes and sizes and are intended for use in flexible shaft machines, electric drills, air tools and drill presses. The tools are efficient and practical for finishing metal patterns, dle castings, smoothing up molds, and so on. Complete table of specifications and prices is included. Copy free upon request.

McCrosky-Super Adjustable Reamers Bulletin No. 12-A. This bulletin, issued by McCroskey Tool Corporation, Meadville, Pa., presents the distinctive features of the McCrosky-Super Adjustable Reamer. A phantom view gives a very clear exposition of the design of the reamer and further illustrations show the different types and kinds of reamers available in this design. The manner in which the pin and screw lock are applied can be clearly understood from the phantom view. Line drawings are used to illustrate the manner in which the reamer attacks the metal. Specifications and prices are included. Copy free upon request.





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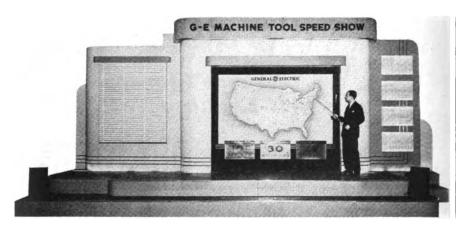
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Educational Value in G. E. Speed Show

ENTERING around the theme "Speed with Accuracy", the General Electric Company has been presenting, at several important industrial centers, an exhibit which has comprised primarily a presentation of the most recent developments in electric equipment for use on machine tools. A sound moving picture of machine tools in operation and exhibits of motors and control devices proved of particular interest to those who attended.

The show was presented at Worcester, Mass., May 17, Cincinnati, Ohio, May 24, and Rockford, Ill., May 28. At each of the shows papers were presented as follows: A. A. Merry, Carboloy Company, "High Production Performance with Carboloy Tools"; A. C. Danekind, General Electric Company, "Requirements of

Electric Equipment for High Production Machine Tool Performance"; R. S. Walsh, General Electric, "Meeting Your Requirements for Motors", and N. L. Hadley, General Electric, "Industrial Control to Meet Modern Machine Tool Standards."

At the Cincinnati meeting, which is taking place as this issue of MODERN MACHINE SHOP goes to press, Mr. J. A. Jackson, General Electric, opened a discussion on "How Application Engineering of Electric Apparatus Can Help You Get Speed with Accuracy", and Mr. Sol Einstein, Vice President and Chief Engineer of the Cincinnati Milling Machine Company spoke on "Requirements of Electric Equipment for High Production Machine Tool Performance."

Abstracts from some of the papers are presented herewith.

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Abstract: Requirements of Electric Equipment for High Production Machine Tool Performance

BY SOL EINSTEIN

Vice President and Chief Engineer Cincinnati Milling Machine Company.



SOL EINSTEIN

While it is realized that existing power plants and equipment make such standardization difficult, steps toward a general standardization of current characteristics of motors in the future is very desirable. Electric current

of the d-c and a-c type is used in this country indiscriminately and the variance in voltage from 110 to 440 volts necessitates individual motors to suit the current characteristics of the individual customer. Variance in phase characteristics of the current simply adds to these difficulties. Thus, we find that machine tools of the so-called built-in type can only be finished after the individual order is obtained by the manufacturer and he knows the current characteristics prevailing in the customer's shop. This results in individual orders of electric motors from the motor manufacturer, instead of the quantity buying which certainly would be advantageous to the electric-motor manufacturer and which would save delay and additional expense to the machine-tool manufacturer and his customer. Some Eurocountries have accomplished standardization in a relatively short time and they enjoy the benefits of simplification of electric-motor equipment.

Another problem of considerable magnitude is the great variety in size and style of control equipment catalogued today by electrical manufacturers. It seems to be natural that when it was possible to standardize the frames of motors it would also be possible to standardize control equipment, particularly such equipment as is commonly used in machinetool applications. For the same capacity and purpose, this starter and control equipment varies considerably in dimensions and designs. Even such simple devices as push-button control boxes vary dimensionally to a great extent. Quite frequently today, starting and other control equipment is employed in machine tools without the enclosing cases, being mounted in compartments in the machines to avoid obstructions on the outside of the main frame and to give the machine a neater appearance. With the omission of such enclosing cases on control equipment, considerable annoyance is experienced by machinetool manufacturers, as well as by the users of the equipment, since the maker's name appears generally only on the outside of the case.

And finally, the wiring itself is of considerable annoyance to the machine-tool manufacturer. This is particularly due to the fact that each shop has its own ideas and fancies,





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and wiring that might please one user might be definitely rejected by another. Standardization of this phase of electric equipment would be very desirable indeed.

While we have thus enumerated criticisms on the present status of applying electric motors as prime movers for machine tools, it is a fact that individual motor drive of machine tools has made tremendous progress and is today practically universally used in new installation. It might be of interest to state here that less than one per cent of the machine tools supplied by the company I represent use other than individual motor drives.

Individual motor drive for machine tools permits the location and reloca-

tion of the tools to the best advantage with respect to their efficiency and the routing of work through the shops. It makes possible the utilization of efficient systems of illumination. dividual motor drive permits the unobstructed use of cranes, hoists, conveyors, and other material-handling equipment. It is not uncommon under group-drive operation for a number of tools to be shut down while repairs are being made to the driving motors or the mechanical parts between motor and tools. Thus, it can be seen that increased and more constant production results from individual motor drive. It also decreases power consumption when the factory is operating in shifts and a number of machines are not used at certain times.

Abstract: High Production Performance with Carbide Tools .

By A. A. MERRY Carboloy Company



A. A. MERRY

Without modern machine tools it is impossible for a manufacturer to take full advantage of the newer cutting alloys that are available today. Probably there is no greater justification for obsoleting old equipment and re-

placing it with new up-to-date equipment than cemented carbide tools that very soon will make it possible for the new equipment to be written off through the increased savings brought about by the use of modern machine tools, tooled with carbides.

The problem facing us with regard to using carbide tools on cast iron, alloy iron, brass, bronze, aluminum, and non-metallic materials is nothing when compared to that of cutting steel. For a long time, we were all of the opinion that we would have to have certain grades of carbide tools before we could ever undertake the economic cutting of steel, but as we worked at it we found that this was one of our minor problems. The major problem facing us today is how to dispose of the chips.

In the case of a single cutting tool, the problem of disposing of the chips



CATKINS AND COMPANY . INDIANAPOLIS, INDIANA



is not so serious; but when you consider a machine that is tooled with anywhere from three to nine tools working on one station and producing chips at the rate we do when using the proper speeds, you get some idea of the problem that confronts us. When we classify it as the greatest problem today in the proper solution of steel cutting, we are not underestimating it in the least and we certainly need the help of every machine tool builder in arriving at the solution.

We have told you of the services we are anxious to render on your behalf. And now we hope it is in order that we in turn ask you for some help, for these things are definitely in the hands of the machine tool builder, and no one but you can give us the help we need.

Let's take an illustration. Assume we have a flywheel to machine. original cutting time was 15 minutes with high-speed steel. Then Carboloy was developed and we now do the job in 5 minutes. True, there is a representative saving; but we have handling time; we have "down time" for changing tools, and we have a number of other factors that enter into lowering floor-to-floor time besides the actual cutting time. And in so many of the jobs that we run into today, we have saved about all the time we can out of the cutting-tool cycle. The other savings that can be made are beyond us and out of our hands. However, out of our experience, we are often able to suggest other ways to save time and money.

To touch briefly on some points which should be given thought, let us consider first loading time. This runs into money on almost any kind of job. And then, tool changing is an item that also absorbs many minutes during the day. Yet the time required for this operation can be reduced if

thought is given to tool-holding methods by the machine-tool builder whe the tools and machines are designed. If a builder will have his tools a designed that they can be ground outside of the machine and slipped quickly into position there will be no time lost getting size.

As machines get larger and heavie there is all the more reason why the should be more automatic in their a tion, so as to save the strength of the operator. It is of the utmost in portance to give the operator ever possible consideration, and then, i order to take the greatest advantag of the tools, it is likewise importar to provide a wide range of speeds an better controls methods, with rapi traverse supplied wherever possible It is better yet if this rapid travers can be made automatic so that ther is practically no time required of th operator except that necessary t start the machine, remove the com pleted piece, and start it on its wa again. To see a machine operate wit automatic loading is certainly a jo to any mechanic's heart and we loo forward to the day when there wi be a great many more of such ma

It is our feeling also that too muc attention is given to attempts to ge a great number of pieces out of on tool before grinding it. We know definitely that we produce more piece per hour at a lower tool cost when the machine is so designed that i is relatively simple to change the too between cycles. By this I mean hav ing the tools ground ahead of time and set to size so that it is only nec essary to slip out the old tool and a new one. Machine-too builders can be of great assistance to us if they will design their machine so that the tools can be changed with greater ease.

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Abstract: Meeting Your Motor Requirements

BY R. S. WALSH General Electric Co.

LL electrical variations in motor design, accentuating one particular characteristic, do so at the expense of others in order to meet the specific requirements. So it is well to keep in mind that the best combination of characteristics in a motor for the majority of ordinary starting duty applications is obtained with the normal torque, normal starting current motor.

You will notice the wide range of ratings covered by the high slip motor. It is this type and wound rotor motors which are used for heavy starting duty and flywheel duty machines. The multi-speed motors provide a selection of as many as 4 operating speeds with one motor, on an a-c power supply, and the d-c motors are adaptable to adjustable speed operation, with a direct-current power supply.

If higher or lower speeds than those inherently obtainable with these motors, are required, we have the means of providing the two extremes of

speed range for you.

For high-speed operation, motors have been designed for operation on high frequency. Inasmuch as the usual power supplies do not offer these high frequencies, the most convenient and economical source of such power supply is the frequency converter. It should be understood, of course, that any intermediate frequency, regardless of the primary power supply, can be obtained with a proper gear ratio between the motor

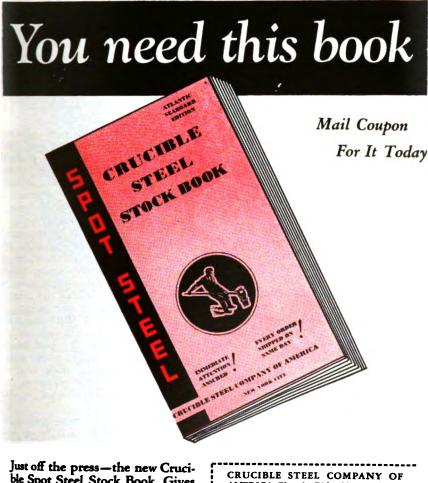
and the converter, with the broad scope of General Electric equipment available. In addition, we have a line of single unit two-bearing frequency converter sets in ratings from 1 to 15 kw.

When motors are operated on the high frequency output of the frequency converter, high operating are possible. Occasionally, speeds your machine may require a low speed motor drive. For speeds lower than normally obtained from motors, we can meet your requirements with a complete line of gear motors. A complete range of gear ratios from 3 to 1 to 136 to 1 is available for combination with the motor of proper basic speed to obtain practically any low speed output desired.

The use of gear motors for low speed drives gives your machine compactness, simplicity of assembly, and a sturdy clean-cut appearance. You save on installation costs and your customer profits by the high efficiencies and low upkeep expense of these convenient units.

While we are on the subject of duty, there is an important motor requirement which may occur, whether duty is constant speed, adjustable speed, or high speed, i.e., dynamic balance. Let's take a few minutes to review the latest developments affecting this important subject.

It is recognized that one of the desirable qualities of machine tools is smooth operation. Of course, the in-



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herent nature of many tools makes this requirement more important on some machines that it is on many others.

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The majority of machine tools operate with this smoothness when using standard motors, but we appreciate that there are machine tool applications where careful attention to the absence of vibration is required if the necessary smoothness of operation is to be obtained. There are tools on which a small amount of unbalance of the motor will cause harmful vibration, just as there are tools on which a very small amount of motor unbalance will be unnoticed or unobjectionable.

In order to keep the unbalance of the motor rotor within the limits required by these two classes of machines, G-E engineers have given the subject of balance a great deal of careful thought and attention.

The preferred motor mounting, when checking balance, is of course, one with which external restraining forces are zero, so that the vibration amplitude is fixed by the inertia of the motor alone and the external effects are eliminated. To approximate this condition, Mr. A. L. Kimball, of the G-E Engineering General staff, and author of "Vibration Prevention in Engineering," and similar treatises on related subjects has demonstrated that a motor should be placed on an elastic mounting, so proportioned that the natural frequency vertically is at least as low as one quarter of the operating speed of the motor. In addition, he found it necessary that the elastic mounting be deflected downward by the weight of the motor, at least by a predetermined amount.

It is, of course, understood that an accurate and reliable vibration indicator must be employed.

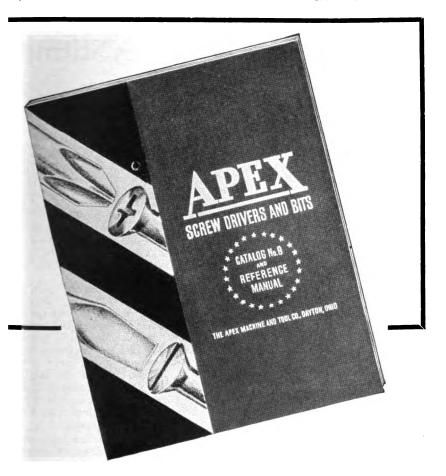
It is believed that Mr. Kimball and his associates have developed a new conception of balance measurement which can be logically applied. Certainly this improved method, because it reduces external vibration reactions to the minimum, provides greater reliability and consistency. It assures that the dynamic balance readings taken on these flexible mountings are not only accurate but uniform and are, therefore, more useful.

A type of duty which we have not mentioned yet is reversing duty. Almost any of the standard constant speed motors are good for normal reversing duty, but special construction is necessary for rapid-reversing duty. Let us consider for a moment, a standard 1 h.p., 900 r.p.m. motor.

With no external WR² connected, 30 reversals per minute can be obtained with this motor. Now, let us consider a 1 h.p., 900 r.p.m. motor designed expressly for rapid reversal service. With this motor the number of reversals possible per minute is 72 with no external WR² connected if standard insulation is used, or 100 per minute if class "B," heat resisting insulation, is applied to the motor windings. Similarly, with a given motor's capacity for reversals is also increased.

A complete line of these special designs is available for satisfying your requirements for frequent starting, stopping and reversing on fast operating cycles.

Rockwood Single-Groove V-Belt Drives are featured in Data Book No. 783, now being issued by Rockwood Manufacturing Company, Indianapolis, Ind. In addition to descriptions and illustrations of the sheaves, pulleys, V-belts and other equipment included in Rockwood drives, the book includes tables giving the part numbers and dimensions of sheaves and pulleys for the different drives and tables giving the pitch diameter, motor speeds and other information for a wide variety of center distances. Copy free upon request.



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MACHINE & TOOL CO., Dayton, Ohio

Welded Design Doubles Stiffness of Press Frame

By H. S. CARD

Development Director, N.E.M.A. Electric Welding Section

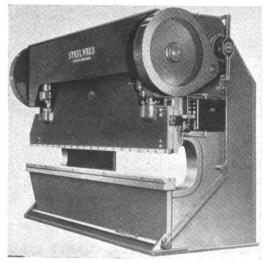
T translates theory into practice," is the neat phrase used by The Steelweld Machinery Company, Cleveland, Ohio, to tell the story of what welded steel construction has done for the Steelweld press brake frame. The company uses the phrase to dramatize its success in building a frame so strong and rigid that the ram does not jam in its guides under excessive overload; and that is doubtless the most important fact.

However, it is interesting to recall that welding engineers frequently caution machine designers to forget all about the conventional forms of castings when designing built-up welded structures—and that only a versmall number of designers have followed this excellent advice. Steel weld has done it. The structures her illustrated derive their "style" from using only what metal is required for the job, and placing it where it will work—and they owe their out standing operating features to the practical application of the same theory.

In this construction the main problem is that of deflection. First, because undue deflection robs the work of its accuracy; second and more important, because deflection has often been the source of disastrous tie-ups due to binding of the rams in their

ways. It did not take long to determine that this problem could not be solved, within economic limits, by a mere increase in mass.

The solution was found when the designer evolved a box-type structure in which the bed, housing and crown became virtually one piece, with interior ribbing to provide added rigidity in critical areas. With very little more weight the frame acquired more than twice the stiffness of any previous design, and became practically unbreak-



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able. The makers state that under full load the ram and bed will be held parallel within 0.005 inch for the full length of die surface.

The hollow box housings, heavily reinforced at the throat, have an 18-inch standard depth of throat, and they permit work to be fed through the end and formed in successive stages. The deep open box section of the crown gives ample room for bearings and mountings. And the new design has eliminated points of concentrated stress.

A further desirable refinement in design was to mount the flywheel between the frame. To accomplish this the old cast iron wheel was replaced by an arc welded steel wheel, reduced in size and turning at double the speed. And finally the cast iron be joint was replaced by a steel be welded into the ram and indestruible.

It is quite obvious from the illust tions that the welded steel frame a part of the machine and is not terior to it. The press brake is self contained that it can be set do anywhere, ready to operate. In fait will operate with its entire ac racy while suspended with cha from a crane, so great is its rigidi

This resistance to deflection originally sought for the principurpose of avoiding tie-ups of rechine and resulting delay to production. One additional advantage is power saving because all the powinput is used to bend the work.

A Letter from the National Machine Tool Builders' Association

To Builders of Machine Tools

10525 Carnegie Avenue, Cleveland, Ohio,

March 29, 1937. Reference: Letter No. 176.

Subject: Your Declarations for Export Shipments

Exports of machine tools aggregated \$24,800,000 in 1936, according to data compiled by the Bureau of Foreign and Domestic Commerce. This is the highest for the ten years of which we have record. The high volume of export shipments emphasizes the need for accurate statistics to keep the industry informed on current activity. The breakdown of the export figures into machine groups may be very valuable from this point on.

Within the past few months our at-

tention has been called to some obous errors in the allocation of exposto the various classes, thereby throing doubt upon the accuracy of tentire report. Investigation his shown that such errors in large paare due to inaccurate or indiffered description of goods on the "Shiper's Declaration" and particularly the insertion of wrong class number called for in the last column of tdeclaration.

The Department at Washington anxious to cooperate with us to t fullest possible extent to improve t accuracy of the classified data. Th have supplied us with a sufficie number of copies of their "Shippe Guide"—1936 edition, for distributito every builder of machine too

The class numbers for power drive metal working machinery are given pages 7 and 8 of this guide. The run from 7400 to 7485, taking in on 25 classifications. Will you not plead determine for your own product to class numbers that are applicable and then make sure that the corresponding to the correspond



120

number is given in the case of each export shipment, as well as a sufficiently clear description of the machine to enable the Department to make the proper classification. Please do not leave the matter of classification to a minor clerk or to your freight forwarder. Have your export declaration filled out by someone thoroughly familiar with the equipment shipped.

The Department's figures are the best indicators we have of the trend in foreign trade, and with the hearty cooperation of all machine tool builders we can be sure of considerably improved statistics.

(Signed) Frida F. Selbert,

Secretary.

A Heavy Duty Engine for the Small Power User is the subject of a fourpage bulletin now being issued by Fairbanks, Morse & Co., 910 W. Wabash Ave., Chicago, Ill., in which this firm presents the features of the new F-M Model 42-E Diesel Engine. This engine was designed for continuous service, but is of lighter weight and smaller dimensions than have been available heretofore. These engines are available in 60 and 90 h.p. in two and three cylinders and incorporate, in a smaller and lighter engine, all of the desirable features of the popular Model 32-E. Applicable in locations where small space and low headroom are of vital importance, the Model 42-E is adapted for all types of manufacturing or processing plants and for practically every requirement for primary power. Copy free upon request.

Cams and Tools for Automatic Screw Machines. This 16-page catalog is devoted to the line of automatic screw machine cams, ground circular form tools, bushings, for drill holders, cross slide knurl holders, knurls, swing tools, box tools, stops, and other tools especially designed for automatic screw machines. The bulletin stresses the point of one-day service on cam cutting. All of the various pieces of equipment mentioned are illustrated and tables of specifications and prices are included. Copy available by addressing Banner Manufacturing Co., 1875 Clybourn Ave., Chicago, Illinois.





chine. The tool proper consisted of a 3/16x %-in. toolbit, A, inserted into

a square hole in the toolblock F. The setting of the toolbit was controlled

by the screw C, which carried a disk

Ideas from Readers

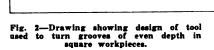
This department is a clearing house for ideas . . . If there is a "kink" or short cut in use in your shop, send in a description of it . . . Each one published will be paid for.

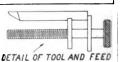
Turning Grooves in Square Workpieces

BY ROBERT W. BRINK

THE illustration Fig. 1 is a drawing of a nickel silver casting intended for use as a leg on a piece of steel furniture. A customer brought

us 3.000 of these legs to be grooved as shown, the grooves to be approximately 1/16 inch deep and 1/16 inch wide, A lathe was selected for the task, and the work was held by an expansion bolt through the hole in the bottom end which contained a center hole for the tailstock center. and a square block bolted to the for which a groove was provided in the toolbit as shown. The block F was guided by adjustable gibs on either side, which were set just loose





face-plate, the block serving both to center and to drive the workpiece. The



Fig. 1—General design of metal furniture leg, showing grooves.

workpieces were rough polished first, so that too much of the grooves would not be removed in finishing.

The tool, shown in Fig. 2, was mounted on the cross slide of the ma-

enough so that the block could slide and at the same time be maintained in alignment. A 3/16x¾-in. roller B was set into the block so that one edge could project and make contact with the work. The spring S, which was 2¼ in. long, was used to hold the tool block forward so that the tool would remain in contact with the work.

With the workpiece in position in the lathe, the cross slide was adjusted so that the roller B was in contact



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ving Machines

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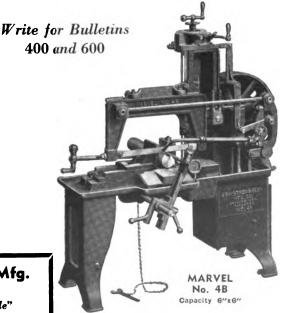
No. 4-B scribed here) VY DUTY

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nnounced and hown for the first draulic feed and quick traverse. A 5,000 lb. giant for heavy work. A Moderately Priced Hack Saw that will out-cut all others in its price class. A really good high-speed hack saw for ordinary miscellaneous or occasional work, although of course, not the equal in efficiency and stamina of our heavyduty, full ball bearing, production models: Nos. 6, 6A, 9 & 9A.



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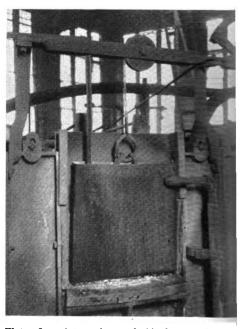
with the flat side of the work. The lathe was then started and the tool fed forward until it was cutting a groove of the desired depth. The lathe was operated at a low speed, and sufficient tension was applied to the spring to keep the roller in contact with the workpiece as the tool-block was moved back and forth by the corners of the workpiece. Actually, the operation was very simple and a smooth, even job was obtained.

Water-Cooled Door for Furnace

By G. F. CAGLE

ORKING in front of the door of a forge shop oilburning furnace is never a cool job, and in a Georgia railroad shop in the summertime it becomes decidedly uncomfortable. To relieve this condition in the Macon shops of the Central of Georgia Railway, several of the furnaces were equipped with water-cooled doors of the design shown in the illustration.

The door is literally a tank through which a stream of water is constantly flowing. The material from which it is made is 4-in. boiler plate, the back, sides, and bottom being formed from a single piece to which the



Water flows into and out of this furnace door co tinuously, protecting the workmen from the heat.

front panel is welded. The space between the front and rear panels is a proximately four inches; thus the door will hold several gallons water.

A water inlet pipe is so locate that it will extend downward into the door at the left side, the end of the pipe projecting just below the top the door when the door is closed. The door when the door is closed.



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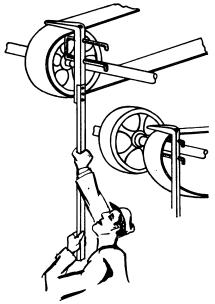
WRIGHT Improved High Speed HOISTS

outlet pipe is set into the door approximately three inches from the top at the opposite side, and is long enough to extend downward into the waste pipe when the door is raised. Thus water can flow into and out of the door continuously, regardless of whether the door is open or closed. Two one-inch studs, extending from the front to the rear panels, are welded in place to serve as hangers.

Improved Belt Pole

BY CHAS. H. WILLEY

THE task of putting a belt onto an overhead pulley when the pulley is revolving is always accom-



As the belt-pole is pushed in the direction of the pulley, the U-shaped pick-up is forced back and the belt is forced onto the pulley.

panied by more or less danger and at times is very difficult. With the type of belt pole shown in the illustration, however, the task is rendered easy and comparatively safe.

While the design and use of the pole are evident from the drawing, a few words of explanation may be helpful. The "working" end of the pole is made from 1-inch square cold drawn steel, mounted on an oak stick. The steel bar is forged to L-shape as shown, and two holes are drilled in it to receive the belt "pick-up". The pick-up is made from '2-inch round steel rod, bent to U-shape. After the ends of the pick-up have been inserted through the holes the ends are bent over so that it can not slip out of place.

To use, the pick-up is slipped out as far as it will go in the direction of the "L" and the belt is grasped between the "L" and the pick-up. The edge of the belt is then caught over the edge of the pulley in the usual manner, with the pick-up against the rim of the pulley. As the pole is forced against the pulley-rim, the pick-up is forced in and the belt is forced onto the pulley.

Whistling Grease Cups

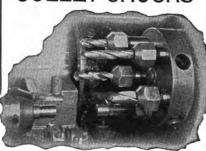
By John A. Honegger

OOSE pulleys on countershafts connected with belt-driven machines usually run continuously while the machines are idle, and unless a systematic plan of oiling is followed, now and then a loose pulley bearing will run dry with attendant scoring of the shaft, burnt-out bearing, and perhaps loss of the use of the machine at a time when it is sorely needed.

Usually when a loose pulley bearing runs dry, the hot bearing squeaks and thus calls attention to its condition. However, by the time the bearing is hot enough to squeak, it is probable that the damage has been done. In one of the plants with



UNIVERSAL COLLET CHUCKS



Automatic Screw Machine, holding Drill - Counterbore - Center Drill and Reamer in UNIVERSAL COLLET CHUCK

[One of the Many Uses]



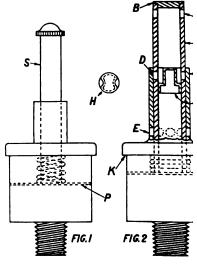
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FOR LITERATURE WRITE TO

UNIVERSAL ENGINEERING CO. FRANKENMUTH, MICH.

which the writer was connected. tendency of the hot bearing to squ was turned to account by makin squeak before it got hot enough burn out; thus the squeak served a signal for someone to get busy an oilcan. This was accomplished fitting each grease cup with an tachment which served as a whi and which would blow when grease got too low.

The grease cups used were



Cross-section drawing illustrating change in standard grease cup so that it would w if the bearing became over-heated. I the standard grease cup. Fig. 2 is th after redesigning.

standard design, such as that trated in Fig. 1. The design modified as shown in Fig. 2, by so ing a tube extension A to the SI pressure guide rod by which for applied to the plate P that co the grease in the cup. The tube closed at the end by forcing in the cap B, and two holes C. drilled in the wall of the tube.

The top, or cap, of the grease indicated at K, was drilled



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Massachusetts.



reamed for the tube F, which was then soldered in place. A number of 3/32-inch holes were drilled on a circle in the wall of the tube. F. close enough together so that the wall between the holes was not more than 1/32-inch thick. A piece of brass, milled as shown at H, was then pressed into the tube A to a predetermined distance, and a hole D was indicated. When asdrilled as sembled. the grease cups screwed into the pulley hubs in such a way that the holes D faced the direction of rotation of the pulleys.

Each cup was then filled with grease, which forced the inner plate up to the top of the cap and accordingly raised the tube A so that the holes D were aligned as shown in Fig. 2. As the grease was consumed, the spring in the cap forced the plate down, carrying the tube with it, until the holes D finally came into alignment with the holes E. The holes

being in alignment, the cup wor immediately emit a shrill whistle th could be heard above the usual hi of the machinery.

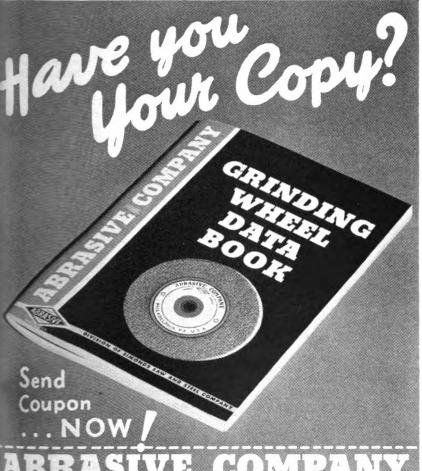
Needless to say, few loose pull bearings burned out thereafter. It though the cost of remodeling t grease cups seemed considerable the time, the reduction of lost till and savings made on machine repairmore than saved this expense matimes over.

Saving on the Lineshaft Drive

By W. F. SCHAPHORST

THE writer has found that me lineshaft drives are hung withoregard for economy, probably due lack of information on the part the millwrights regarding the mann in which such economies can affected. The fact is that both the





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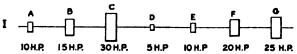
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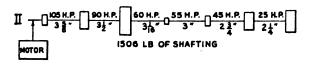
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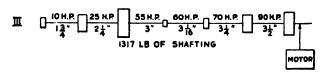
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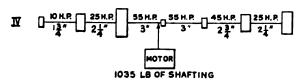
cost of the shafting and the cost of power can, in many instances, be kept to the minimum by the application of a little thought. The drawings herewith will illustrate how this point may be accomplished.

The pulleys on the lineshaft marked I are 10 feet apart. Pulley A will transmit 10 h.p.; B will transmit 15









Economies can be effected by the proper location of lineshaft drives.

h.p.; C, 30 h.p.; D, 5 h.p.; E, 10 h.p.; F, 20 h.p., and G, 25 h.p. respectively, at a shaft speed of 200 r.p.m. The problem is to place the motor in the position that will necessitate the least weight of shaft and that will reduce the amount of power required to the minimum. Reduction of power is accomplished through reduction of friction.

The drawing of lineshaft II shows the sizes of lineshafts required between the pulleys to transmit quantities of horsepower with motor or driving pulley at the treme left end. The minimum siz shaft is 2¼ in. at the right end, the maximum size shaft require 3% in. at the left end.

Drawing III shows the size si required with the drive at the

treme right end.'
time the minir
size of shaft t
can be used is
in. and the m
mum size requir
3½ inch.

Drawing IV sl how to determine correct position the drive. The st tion lies in wor inwardly from ends and placing motor on the "si imum" size sh The maximum here is 3 inch.

Computing weights of the sing required in III and IV, it wis found that wit feet between pulley, 1506 lbs shafting will be quired for line 1317 for line III 1035 for line IV

other words, line II requires 45 cent more shafting than line IV line III requires 27 per cent than line IV. Line IV will op with least amount of friction better smaller the shaft, the less surface speed and consequently less the power loss.

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Machine Tools-Econis

Over the Editor's Desk

ORE important than anything your editor could say message that Tell month is the Berna, General Manager of the National Machine Tool Builders' Association, delivered to the assembled guests of the General Electric Company at that company's recent Machine Tool Meeting in Cincinnati. part of Mr. Berna's address follows:

"About a hundred years ago the development of the reaper, and the gradual opening up of good farm land, gave the American farmer surplus crops which he could sell for cash, and made it possible for him to begin to buy those things which he had been making for himself, laboriously, on the farm. Simultaneously the demand for machine tools developed and the industry became of increasing importance as the demand for machinery increased in the indus-

trial centers of the country.

"Hanging in the office of the Brown & Sharpe Company, of Providence, Rhode Island, is a schedule of working hours which was written by Mr. Lucien Sharpe, the founder of Brown & Sharpe, when he was employed at the Providence Machine Company's plant in the winter of 1847-48. During most of the months work began at sunrise, but in May, June and July the worker was allowed to idle in bed until the atrociously late hour of 4:55 a. m. He stopped for breakfast at 6:30 and went back to work at ten minutes after seven and the day continued until 6:45 in the evening, with 55 minutes off for lunch in the middle of the day. The total hours per week varied somewhat as the time of the sunrise changed in the different parts of the year, but the minimum number of hours worked per week was 621/2,

and the maximum was 77.4.

"That is in sharp contrast present conditions. We are cally standardized on a 40 hour The important thing to real that this change has not come by legislation. In 1899, long the 8-hour day was legally rethe average hours per week i country were 55. Here then is stantial reduction from the Lucien Sharpe. By 1920 the a hours per week in this count become 48 hours, by 1930 the a was 44 hours and today it is cally 40 hours a week. The imi point is that this improvemen effected, not by legislation. I giving the worker better equ which made it economically p for him to earn a living wage working shorter hours.

"It would be a simple matter t that this change ran parallel other equally important chan that was in the real value wages paid to the worker. were increased, again not by tive fiat, but by the increased ing power of the worker, due better equipment which we ga or, if you please, because of crease in horse-power per during these years.

"In contrast to this perfectly development toward lower hou higher wages, we have the an restriction of output by union tions which is familiar to the building trades. These did not wait for improved m improved materials, and better ment to make it economically to reduce working hours and i wages. They reduced them arb and the net result has been to

gitized by GOOGLE

he building industry and force us to ive in obsolete antiquated houses because the cost of new construction is intirely out of line with the development of the country in other fields.

"The machine tool has also served the nation by making possible lower costs and that, in turn, means increased markets and the consequent the michael of human life by making the possible for us to have in our homes as every-day necessities the things that our grandfathers would have considered luxuries, or would not have the mad available at any price.

"We are a little inclined to overlook

the fact that the modern machine tool loes not require as high a degree of skill on the part of the individual workman. Accuracy is built into the machine and in the measuring instruments which the worker uses to check the product of the machine. A worker with little training a hundred rears ago was helpless, because everything had to be done by hand and wen the products of the elementary machine tools of that day had to be corrected by skilled artisans who did their work by hand

their work by hand.

"This means that we can open our lactory doors to these semi-skilled men and to some who have practically so skill at all and enable them to earn high wages in the operation of mathines. The skilled men, who are now as scarce as they have always been, we can employ to build these mathines and these gauges.

"Industrial progress can be halted by uncertainty and fear, or by writing into restrictive legislation our hopes for the future without taking the time or the pains to check them against the experience of past years to see if they are within reach or not. It can be retarded by such a law as the lax on undistributed profits which has inflicted a definite hardship on thousands of corporations of medium size. It has practically forced the distribution of assets which should be conserved to replace those lost during the last depression. The development of

"In the machine tool industry alone, a cross-sectional check indicated that our companies lost 40 per cent of their capital assets during those difficult years. What is to happen if we have another depression in the future, and go into it with limited assets so that we cannot hold together the nucleus of highly trained personnel which means so much to the machine tool builder? It is not helpful to suggest that he can go out and sell stock in his company, because during a depression no one can sell stock at a reasonable price, nor can he at that time borrow money from a bank.

"It is the duty of every one of us who understands these fundamental facts to emphasize them and see that they are more widely understood. We are no longer a sprawling, disjointed group of states, but a closely knit industrial community. Even the farmer uses mechanical equipment in the fields and in his home. He gets his market quotations by radio and sells products across the continent. This is in every sense of the word an industrial nation, and very few of us are selling to a local market. tremendous distribution of farm products can easily be noted in any grocery store, where apples from Oregon. oranges from California and grapefruit from Florida are offered side Tale Examp

"Business men must learn to think in terms of the nation and must pass the results of this thinking on to those who should profit by our experience. I hope that as we have worked together to overcome technical difficulties we can cooperate in developing a better public understanding of the part machinery has played in this industrial nation, and that our future lies in using it more widely and more effectively."

New Shop Equipment

Farrel-Birmingham Gear-Hardening Machine

Illustrated herewith is a gear-hardening machine which the Farrel-Birmingham Company, Inc., 381 Vulcan St., Buffalo, N. Y. has been developing the past four years especially for hardenseen that the arbor carrying the ges supported on anti-friction roller which are so arranged that they wi carry arbors or shafts of a large rang of diameters. This method of holdin work is very convenient.

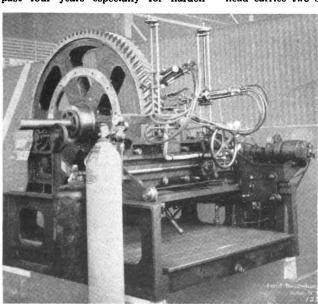
The machine is so designed that eac head carries two sets of torches, or tip so that both side

of a tooth as hardened simultaneously. In opera tion, one torc head starts hard ening at one en of the tooth an the other torc head at the othe end of the toot? They each trave toward the center or apex, of th teeth. Their tra verse is horizonta but a guide rolle fixed on the torc saddle, or carrie engages the geabeing hardene between two teet and thus revolve the gear in correc relationship to th horizontal travers of the torches.

The helical trac of the teeth is therefore, in effect followed by th torches without th necessity for an complicated mech

anism. The guide pin, or roller, referred to, is supported by a bracke attached to one traverse saddle of torch head. It also acts as an index

The rate of travel of the torches witl the attached water jets can be regula ted by turning the handwheel of a variable speed gear. The usual rate of traverse is from 6 in. to 10 in. per minute, varying with the size of tooth to be hardened. Each torch head is als fitted with a pilot light for igniting the main torches. This pilot light together with the gas supply to the main jets or torches, are controlled by one lever



Farrell-Birmingham Gear-Hardening Machine

ing double helical gears. The torch hardening method, in which this ma-chine is used, permits the hardening of the tooth surfaces of relatively large gears without appreciable distortion.

When properly carried out, the flame-hardening method is very successful for hardening gear teeth of coarse pitch, the sizes for which it is most applicable being from 6 DP to 1 DP. This method is not sufficient for gear teeth of finer pitch, since such gears are usually small enough in diameter to be hardened in a furnace without distortion.

Fig. 1 shows the machine in operation on a large hoist gear. It can be

To obtain the desired hardness and the desired depth of hardness as well as uniformity, very fine and exact adjustments of the tips, or burners, and of the water jets are essential. It is further claimed that, due to much laborious research work, great economy in gas consumption has been obtained. And, of course, economy in labor and time results from the use of duplicate torch heads, each of which hardens both

sides of a tooth simultaneously.

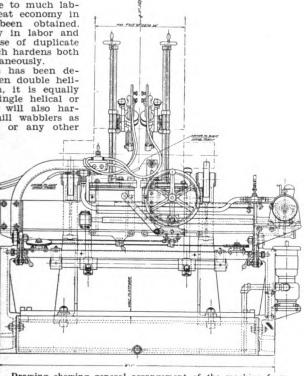
Although the machine has been designed especially to harden double helical or herringbone teeth, it is equally suitable for hardening single helical or straight tooth gears. It will also har-den splines or rolling mill wabblers as well as sprocket wheels or any other

similar type of article.

Fig. 2 shows the general arrangement of the machine from the side and front, respectively. The maximum capacity of the machine is a gear of 84 in. diameter and 24 in. face. The overall dimensions are 6 ft. 8 in. wide x 9 ft. 6 in long. The water tank, forming the base of the machine, has a capacity of 250 gallons. A centrifugal motordriven pump is provided with a suitable relief valve and other necessary fittings so that the water pressure is kept constant and of the correct volume. It has been found that the water pressure from the city water mains is not sufficiently uniform.

Seven different sizes of tips, or burn-

These work. are easily and quickly placed in position. The machine is



Drawing showing general arrangement of the machine from the front.

simple to operate, and an intelligent ers, are suitable for the whole range of operator can quickly be trained.



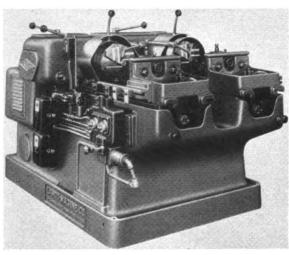
A lathe for small and large swing work. Long distance between cen-Three lathes in Saves space. duces cost.

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Cincinnati, Ohio

Lanhydro Hydraulically-Operated Turning Machine

A double-spindle machine designed for turning shafts and other similar cylindrical parts, to be known as the Lanhydro, has been brought out by Landis Machine Company, Waynesboro, Pa.



Lanhydro Hydraulically-Operated Turning Machine

The Lanhydro is a semi-automatic hydraulically-controlled machine, designed to proceed through its entire cycle automatically with one tripping of the control lever.

In general, the appearance of the Lanhydro is similar to the Landmaco Threading Machine and all the tested mechanical features of the Landmaco have been retained. A special centering device for supporting the work during the turning operation has been added. This special centering devicensists of a female center backed to by a long spiral spring to keep the presure against the work constant. The center travels back through the spind with the advancement of the carriage By using the travelling center to support the work, concentricity between the contract of the carriage by the carriage of the carriage by the carriage of the ca

head of the shaft at the turned stem is a

sured.

The hydraulic unit at its control valve are particular interest. rapid feed is provide to carry the work to ti turning head. A coast turning feed is the used throughout the machining operation a point within 0.008 t to 0.010 in. of the shou Where a should must be faced, a fine finishing feed used. The length of the travel of the finishing feed is adjustable any material or cond tion.

The carriage advance under a finishing fet to a definite stop. variable "dwell" time then provided for a final clean up and make possible the bold

make possible the holding of extremely close limits in length from the end of the shaft to the factor of the shoulder. After the "dwel period, the turning head opens und hydraulic pressure and the carriage apidly returned to complete the cycle The turning head automatically close as the carriage returns.

By using the Lanco as a turnine head, very close limits can be maintained on diametrical size. The head readily adjusted to any diameter and





The "Gardnerench" making up a fitting securely held in the Billings Improved Chain Pipe Vise.



Catalog of Billings Forged Shop Tools gladly sent. Write Dept. 'O'.

Maintenance Tools

he name Billings on Forged Tools guarantees enty of endurance to stand the gaff of heavy, bugh maintenance work. Such Forged Tools as the Billings Improved Chain Pipe Vise (capacies from 1/8" to 8") and the "Gardnerench" capacities from 3/8" to 6") are used daily in a maintenance of mills, factories and machine shops.

ize on Billings Forged Tools—it's an economy!



Elongated Knurled Nut — plenty of finger-gripping surface for quickly adjusting chain slack — an exclusive Billings feature.

COMMERCIAL DROP FORGINGS . BOARD DROP HAMMERS and DIE MAKING MACHINERY

BILLINGS

THE BILLINGS & SPENCER CO.

HARTFORD, CONNECTICUT, U.S. A.





A heavy duty, portable machine, engineered and built to give long, hard service. Smooth quiet operation is assured by SKF ball bearings. Telescopic stand—42" normal height—extends 15" to 57" high. Motor swivels and locks in any position. Motor and yoke can be detached for over-head suspension. Deep hase serves as tool tray. Casing is rubber covered. Hand piece has ½" spindle and over-size, heavy duty SKF ball-bearings.

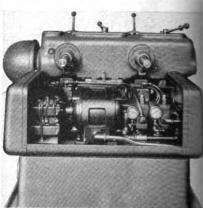
All types of flexible shafts made to individual specifications.

Walker-Turner Co., Inc.

767 Berckman St.

Plainfield, New Jersey

equipped with a micrometer graduation for close accurate size changes. Due to the fact that four cutters are used, operating in the same plane in relation to the axis of rotation and against the shoulder of the cut, a perfectly round



View of Lanhydro Turning Machine Showing Hydraulic Mechanism

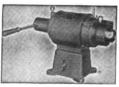
smooth turning job is produced. This makes it necessary to leave only a minimum of metal for the grinding operation.

400-Ton Rapid Acting Hydraulic

Press

The Watson-Stillman Rapid Acting Hydraulic Press illustrated, a product of The Watson-Stillman Co., Roselle, N. J., is of the reversed cylinder type with self-contained power unit and is designed for metal forming and straightening. The press operates under a hydraulic pressure of 2500 lbs. per square inch on a 20 inch ram or 24 inch stroke

IDEAL SPEED LATHES



FOR LAPPING
FINISHING
POLISHING
SMALL PARTS

2 Speed Motor. Automatic Brake. Collet or 3 Jaw Chucks. Hand operated or automatic. Write for Cir. 351.

SCHAUER MACHINE CO.

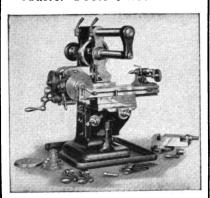
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PRECISION BALL, ROLLER AND THRUST BEARINGS

"Stark",

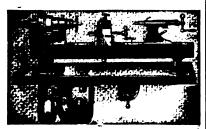
Master Tools Since 1862



Spiral and Plain, with Motor Drive Unit or Countershaft.

Ideal for every exacting Laboratory or tool-room work.

Equipped with fast feeds for manufacturing and specially fitted for handiness in operation. Index Centers are by far the closest of any in this small size.



Stark Precision Lathes incorporate every known device for speed and extreme accuracy. 6 Sizes. $\frac{1}{4}$ " to $1\frac{1}{4}$ " collet capacity up to 12" swing.

Spring Bind Heads, Lever Chuck Closer Heads for very fast and accurate production of small exacting parts. Automatic Turret Heads, Diamond Die Tools, Sensitive Drills and Tapping Machines, Chucks, Collets, Special Precision Tools.

STARK TOOL CO.

WALTHAM, MASS.

Originators of the American Bench Lathe

and develops a maximum pressur 400 tons.

The main ram and moving plate advanced and returned at high by means of two double acting cylir high pressure being automatically mitted when the moving platen re the work. The operating speed oppress, when using the maximum s



Watson-Stillman 400-Ton Rapid Ac Hydraulic Press

of 24 inches, is 9 complete cycl minute. The movement of the ram is controlled by a single leve veniently located at the right corner of the press. The movem the main ram can be restricted part of the 24 inch maximum str means of adjustable collars on the tical control rod.



Top view, showing unusually long ways and nearly twice the usual length of slide bearing.



... last longer

The life of a die is determined by the smooth, accurate operation of the press. Certain combined advantages in V & O Presses assure longer die-lifehence better results at less cost. Unusually long ways and exceptionally long slides are features of all V & O Presses. In the inclinables, the slides are almost twice the usual length. These advantages, plus the positive and smooth operation of the clutches, the balanced flywheels, the accurate alignments to avoid deflection insure perfect operation without jars, without shocks, with the minimum vibration . . . extending the life of the dies, producing a great many more pieces between grinds, delivering precision workmanship with speed-and economy! These are inherent characteristics of V & O Presses-YET COST NO MORE.

THE V & O PRESS COMPANY HUDSON, N. Y.

TRENTISS & CO., New York, Hartford, Busin, Streenes, Buffalo.

MEMALL & HUBCHART MACHINERY CO., Chi-

THURS FRENCH MACHINERY CO., Detroit.

ELLIOTT & STEPHENS MACHINERY CO. 51 Limits TIDEWATER SUPPLY CO. Norfolk and Resease, Ya. Celembia, S. C. Asheville, N. C. D. S. MAIR MACHINERY CORP. Houston and Dallon Tra-

D. S. MAIR MACHINERY CORP. Houston and Deliae. Tra-JOSEPH F. PFLUM SALES ENGINEERING CO. Graceacti. Obia. Pressure is supplied from a variable displacement pump of the radial piston type driven by a 30 h.p., 900 r.p.m. motor. Control of the motor is effected by a magnetic switch through a push button station located near the press control lever. Pump, reservoir and motor are mounted on a bracket attached to the cylinder yoke. The main cylinder and platens are of high grade cast steel; the main ram of close grained cast iron and the tie rods of forged steel. The main cylinder is bronze bushed. The double acting cylinders are made of machinery steel and are of the piston ring type.

Lees-Bradner "H.T." and "L.T." Thread Millers

The Lees-Bradner Company, 6210 Carnegie Ave.. Cleveland, Ohio, has augmented its line of thread milling machines by the addition of two new machines to be known as the "H.T." and "L.T." types. The H.T. machine is built in two sizes to take work up to 12 in. in diameter and capacity lengths of 4 ft. 6 in. and 8 ft. 6 in. between centers. It has a rated cutting capacity of 2½ in. circular pitch. The standard machine has a 6-in. diameter hole

through the collet and work spindle. The L.T. machine is built in two sit to take work up to 6 in. in diame and capacity lengths of 36 and 72 between centers. It has a rated cutticapacity of 1 in. circular pitch and standard machine has a 3-in. diame hole through the collet, work spin

and tailstock.

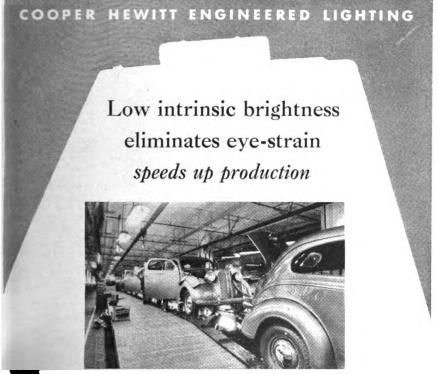
These machines are of very rug construction with extremely heavy is section and large, ample ways. The dividually driven work head and cut head are electrically interlocked so the headstock motor cannot be operaunless the cutter head motor is in of ation, thus avoiding any possibility spoiling the work or cutter. This struction eliminates long shafts the attendant possibility of spring.

Push button control is provided, we the motors instantly reversible through drum switches at the operator's he traverse is controlled through trically controlled limit switches, so for which are readily accessible.

The standard machine has a sepa individually motor driven coolant pi which assures an ample supply of c ant at all times irrespective of spi speeds. Standard equipment inclian an outfit of wrenches, set of cutter s



The BIITHMAN MACHINE



Cooper Hewitt Mercury Lamps help skilled workmen do a better job on this assembly line.

Glarden, and unvarying in intensity throughout the ¹⁴ hours, Cooper Hewitt Mercury Light permits more uniform production . . . better work. Its long light source permits light to get down inside even complicated mechanisms and hard-to-light spots. Efficiency and precision are aided from top to bottom by this soft, shadowless light.

Cooper Hewitt's yellow-green light alone is the ideal illumination where perception of detail is most impor-



STANDAR! COOPER

Better than daylight" for over 30 years

tant. Where color discrimination is desirable, incandescent lamps can be added to the mercury—achieving a close approximation to daylight.

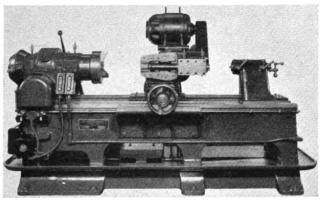
General Electric Vapor Lamp Company engineers are lighting specialists with over 30 years' experience. They will gladly discuss "engineered lighting" for every job with you. . . . General Electric Vapor Lamp Company, 897 Adams Street, Hoboken, New Jersey.

COMBINATION MERCURY AND INCANDESCENT



For use where color is of importance

GENERAL ELECTRIC VAPOR LAMP COMPANY



Lees-Bradner "H. T." Standard Thread Miller

gears, set of lead and feed gears, collet, driving dog and center, tailstock center, one dividing plate with 24 divisions, and a follow-rest together with quick acting tailstock.

Both motor drives are through V-belt with simple adjustment for take-up. The main work head motor is mounted partly in the base of the machine and

the motor for driv ing the cutter hea is mounted direct on the cutter hea The lead and fee gears are so arrange that each may independ changed ently of the othe separate set gears being provided for work spind speeds. These gea may be changed a cording to a cha furnished with th machine without any way affecting the lead being c AI or vice versa. the lead gears ma be changed withou in any way influ

encing the work spindle speeds.

The cutter head of the H.T. maching is provided with slip gears for changing the cutter speeds which, in conjunction with a quick speed change in the head gives a variety of speeds which will accommodate all classes and pitches to be cut. Two cutter speeds are available through the medium of the quickless.

NEW

U. S. No. 1 Anti-Friction Bearing

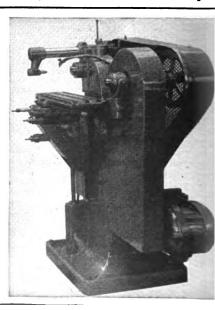
Hand Milling Machine

The New U.S. Hand Miller is particularly adapted to high speed light milling operations. Vertical and horizontal feeds.

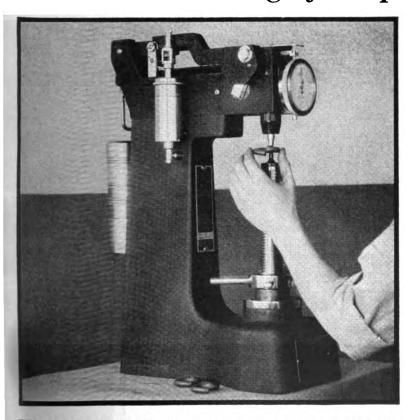
Improvements: Heat treated chrome nickel steel spindle, Timken bearings, Ballbearing countershaft, V-bell drives, 6 Spindle Speeds up to 1592 R.P.M., providing efficient use of small end mills.

Write for full details.

The UNITED STATES MACHINE TOOL Co. 1954 W. 6th St., Cincinnati, Ohio



The Hardness Testing of Shapes



THOUSANDS of odd shapes are tested on "ROCK-WELL" Hardness Testers. In the illustration above we have several manufacturers of lock washers empired simple pedestal type of anvil we have supplied for pieces. The "ROCKWELL" likes practical testing all as a dog likes a bone.

CONCORD AVE. 6 143rd ST.

WILSON MECHANICAL INSTRUMENT CO., INC.

NEW YORK, NEW YORK change lever and nine cutter speeds are available through slip gears. The cutter head of the L.T. machine is arranged with six selective speed changes controlled through the medium of levers at the side of the cutter head whereby cutter speed changes may be made instantly.

The lead screw is of coarse pitch and heavy design, guarded for its entire length against shapes or cutter coolant. Cutter slide ways are fully protected irrespective of the diameter being threaded. The usual worm and worm wheel method of indexing is employed. The indexing wheel is conveniently positioned, the index worm being located below the worm wheel instead of above as in previous designs. The index wheel or dividing plate is now under cover but readily accessible.

The work spindle is provided with two driving wheels; one a worm and worm wheel for large diameter work or work of coarse pitches and where the work is to be indexed. The other drive employs a large diameter spur gear which is utilized only when cutting single thread work which does not have to be indexed, and work of finer pitches. The H.T. standard type machine will cut all leads from 16 threads per inch to one turn in 60 in. and the L.T. standard

type machine will cut all threads 32 threads per inch to one turn in. Quick return speeds are from in. per minute to 112 in. per midependent on the lead being cut both machines.

The No. 8 H.T. machine requires space 4 ft. 1 in. by 9 ft. long an No. 12 H.T. requires floor space 4 in. by 13 ft. long. Net weights are lbs. and 9650 lbs. respectively. 6x36-in. L.T. machine requires space 3 ft. 9 in. wide by 7 ft. 3 in and the 6x72-in. L.T. machine refloor space 3 ft. 9 in. wide by 10 ft. long. Net weights are 5600 and 740 respectively.

Progressive Welder Co. Sp Welding Fixture

The fixture illustrated is typic the line of spot-welding fixture signed by the Progressive Welder Credit Piquette Ave., Detroit, Mich., to be with the Progressive Hydraulic With Gun for uniting sheet metal parendium production systems. The tures are comparatively inexpensive cause of the simple method of fation and will more than pay for

HOW TO GET WHAT YOU WAN IN ANY KIND OF TOOL

Here, at last, is a real help for the man responsible for tools—help which is not offered by any other book in existence. It shows how to get the extra properties you want in any kind of tool.

Just published

TOOL STEEL SIMPLIFIED By Frank R. Palmer Assistant to the President

Assistant to the President The Carpenter Steel Company 315 pages — 6 x 9 — 205 Illustrations. \$1.00 postpaid in U.S.A. Gain more complete control over your tool problems with the help of this new handbook. A plain, practical, common sense explanation of how to make tools that last longer — how to get bigger production and lower tool costs. This is the first book to give you a similar to the control of the costs.

HOW to stop tools from warping HOW to avoid grinding checks HOW to make tools wear longer HOW to make tools that won't break

HOW to prevent size change HOW to make the spark test HOW to be a trouble shooter

plified method for the selection and heat treatment of tool steel. It provides ready answers to many questions that come up in the tool department.



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Please send me postpaid the convenient new 315 page handbook—"Tool Steel Simplified", inclosing \$1.00. (Price \$3.50 outside U. S. A.)

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City and	State	Firm or	Employer

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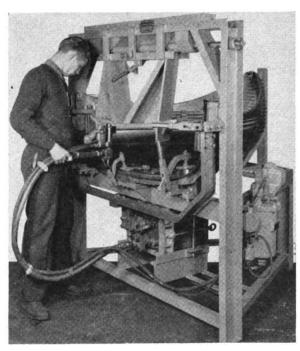


noise is but part of the

and after three months was found to be in perfect condition.

specify Baldwin-Duckworth. Write for catalog. Baldwin-Duckworth Chain Corporation, Springfield, Mass.





Progressive Welder Co. Spot-Welding Fixture

extra investment over make-shift set-ups.

The parts to be welded are clamped and positioned by quick acting devices, so that the finished assembly will fit its corresponding parts. The copper bus-bars are cast to fit the parts to be welded, insuring uniform identical assemblies. The transformer and hydraulic booster for the hydraulic welding gun are mounted in the fixture making a

compact unit, which is real advantage in sho with limited floor spa

The compact and cessible arrangement all clamping devices, t placing of the work i loading and unloadi with minimum handli the ease of handling a positioning the hydrau spot-welding gun a said to be features this very efficient un Only connection to a water and electric source are necessary put this machine in c eration. As all prodution fixtures are entire different and every one special custom built j this company because its experience and know edge of spot-weldi problems offers a r service to production a manufacturing plants.

I-R ¼ H.P. Air Compressor

pany, Phillipsburg, N.
has announced a n
line of fractional hor
power air compressors
¼ and ½ horsepou
These units are very comp
at in appearance. They he

Ingersoll - Rand

and neat in appearance. They he automatic start and stop control, equipped with a new style seamless stank, and an improved check valve.

When furnished for single phase crent they are equipped with a brushl capacitor type motor and a built automatic protection switch giving ov load and under-voltage protecti
They are rated for 150 pounds per



GREENERD

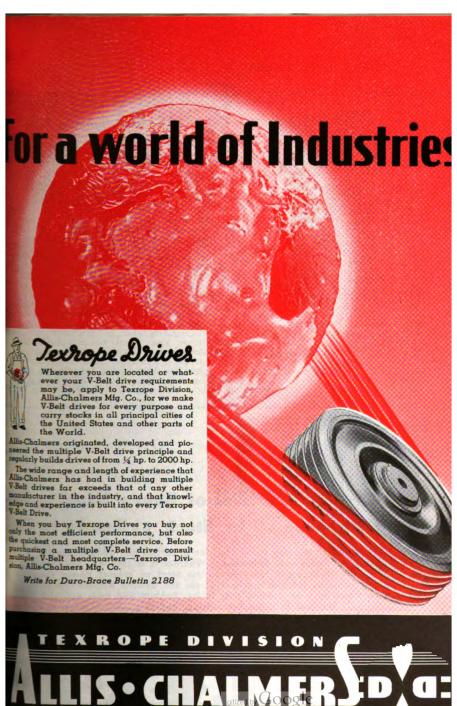
Arbor Presses

500 lbs. to 35 tons pressure

HYDRAULIC, MOTOR DRIVEN, HAND OPERATED

Greenerd Arbor Press Co., Nashua, N. H.





154

in. maximum pressure, but may be set for lower pressures, or may be equipped



Ingersol-Rand ¼ H. P. Single-Stage Air Compressor

with a reducing valve for still lower pressures.

The ¼ and ½ horsepower units are available on a 2.4 cu. ft. tank, which is illustrated. This unit is less than 35

inches high. The ½ horsepower size also available on a 4.6 cu. ft. tank.

Oliver Metal Spinning Lathe

The Oliver Machinery Compas Grand Rapids, Mich., has placed on t market a 12-in. ball bearing varial speed unit type motor-driven me spinning lathe, to be known as t "Oliver". This lathe can be adjusted any speed from 800 r.p.m. to 2400 r.p.

The 12-in. spinning lathe has a h.p. motor for single, two or three ph 60 cycle, 110 or 220 volts. It has overload dial-operated switch with ov load protection. The front bearings of the ball type and are provided woil by means of a large oil chamber. I headstock is provided with a la thrust ball bearing to withstand hes constant pressure. The headstock also fitted with a 6-in. face plate.

The spindle is 1½ in. in diam and has a ½-in. hole through its enlength to facilitate removal of cent

The spindle is 1½ in. in diame and has a ½-in. hole through its en length to facilitate removal of cent. The inside end is threaded for i plates and bored to receive a No Morse taper shank. The outside carries a combined hand wheel and plate for holding the spindle for reming front face plates. This is also t as a rear end face plate and for tr

STEEL of Every Kind . . f

Every Purpose .. in Stock .. Ready to U

Here is steel in every shape and size in carbon and alloy grades—in stock for Immediate Shipment. Whether it is standard shafting or the finest accuracy stock—stainless steel or special flame cut plates, you can get quick delivery from the nearest Ryerson plant. Allied lines such as welding rod, solder, bobbitt and tools are also included. Unusual facilities for cutting, handling and shipping assure accuracy, dependability and speed.

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Joseph T. Ryerson & Son, Inc., Chicago, Milwaukee, St. Louis, Detroit, Cleveland, Cincinnati, Boston, Philadelphia, Jersey City

RYERSON

ENNSYLVANIA CRASHES THROUGH!

This month's \$5.00 prize for the winning "Shop Hint" goes to Mr. E. L. Sleppy, tool-maker, of Beaver Falls, Pa. Mr. Sleppy's hint is a good one to know—and it shows some because thinking.

Try your hand at a "Shop Hint"! It will take you only five minutes to jot down one of those kinks you use to do your work easier and better—md it may earn a dollar a

of those kinks you use to do
your work easier and better—
and it may earn a dollar a
minute for you! Write it on a postcard if you wish — mail to The

TO SUPPORT A
SHAFT IN A LATHE
WITHOUT SCORING
This Manual.

This Month's Prize Winner

Mr. Sleppy says, "I had to turn

Not wanting them scored or

to our storeroom and got a Fafnir

the correct bore to fit the shaft.

Steady-rest, and resting the shaft

in the bearing the job was made

easy. The shaft was not marked

aged in any way." Try this one

HINTS FOR EASY BEARING REPLACEMENT

Fafair Bearing Company, Care "Shop Hints," New Britain, Conn.



Use These Fafnir Cartridges!

FAFNIR CYLINDRICAL CARTRIDGE FAFNIR FLANGE CARTRIDGE



spend as a unit, complete with famous Fafnir fick lane fine Ball Bearing solf-aligning type. saily adetable to many machines, it is fitted in straight-lared bouning with a push fit. Bearing looked to the shaft by exclusive Self-Locking discipatifity the shaft through, engage the collar of set the stray.

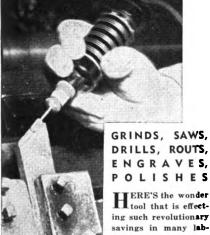
for the application where the very minimum amount of machining is to be done. The unit is mounted by beits through the finance. The bearing is solf-silinging to compensate for slight shaft misalignment. Simple, effective seals exclude dust and dirt. Compact, easy to install, it has many applications.

Send for descriptive literature. The Fafnir Bearing Company, New Britain, Conn.

FAFNIR BALL BEARINGS

BALANCED LINE . MOST COMPLETE IN AMERICA





production lines. on machines can now

alloys.

oratories, model and tool rooms and on Hard-to-get-at places be repaired without removing the part or dismantling machine. The Handee uses 200 different accessories, instantly interchangeable, for work on all bakelite. celluloid. wood.

glass, resins and other hard substances. Finest, speediest, most powerful tool for its type. 25,000 r.p.m. AC or DC, 110 volts. Weighs only 12 ounces. No shop or factory can afford to be without the Handee. Try one.

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ing the spindle by hand when ma adjustments. A plunger type pos lock, when pressed inwardly, engage one of three equi-distant slots in a keyed on the spindle inside of motor and thus gives an easy and !



Oliver 12-In. Metal Spinning Lathe

tive method of locking the spindl removal or tightening of faceplate The tailstock is of open-side d being 7 in. long and 6 in. wide. spindle is machine ground steel, in. diameter, 8 in. long, bored for 2 Morse taper and held in position

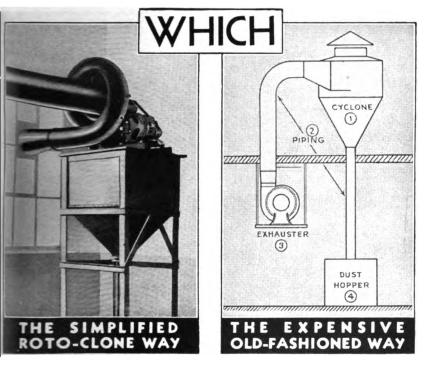


Specimens of metal work executed of Oliver 12-In. Metal Spinning Lath

a lever clamp. The tailstock is rel by the backing of the screw. On with carriage attachment, the tai is furnished with a set-over devictable work. The spindle has a tr of 4 in. A ball bearing live cen standard on the 12-in. lathe.

A set of five spinning tools is inc as standard equipment—one be

gitized by GOOGIC



ROTO-CLONE combines work of both blower and dust seperator in a single unit, replacing the exhauster and cyclone seperator ordinarily used for this service. ROTO-CLONE SAVES SPACE—it is no larger than an exhauster of the same capacity. ROTO-CLONE SAVES PIPING—it may be located at or near the source of the dust. ROTO-CLONE SAVES POWER—because its mechanical efficiency is industry than that of an exhauster and because it eliminates the cyclone.

Let. even more important than ROTO-CLONE'S economy of space, installation, the exercition is its higher efficiency in dust separation when compared to a systems or any other type of centrifugal separator. Write for Bulletin No. 270-H.

AMERICAN AIR FILTER COMPANY

342 Central Avenue

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In Canada—Darling Brothers, Limited—Montreal, P. Q.

ROTO-CLONE

COMBINED EXHAUSTER & DUST SEPARATOR

tool, one cut-off tool, one flat nose tool, one narrow flat nose tool, and one round point tool. These tools are two ft. long with conveniently shaped wood handles. Each tool is made of the highest grade steel.

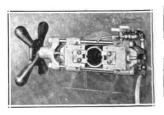
The lathe is furnished with long floor legs, making the top of the bed 36 in. from the floor. Shorter legs are available if desired.

Beaver Model-A Portable Pipe Cutting and Threading Unit

Beaver Pipe Tools, Inc., Warren, Ohio, has announced an improvement in the design of its Beaver Model-A Portable Pipe Cutting and Threading Unit. The improvement consists in the choice of a wheel-and-roller cutoff or automatic knife cutoff, either of which is available to the use at the same price. This feature enables the user to select the type of cutoff best adapted to his particular task.

The knife cutoff is highly efficient for cutting soft electrical conduit, also for scarfing pipe for welding and for grooving pipe for Victualic couplings. The wheel and roller cutoff is said to be simple, fast and foolproof. The upkeep

cost is negligible. This cutoff emplone cutting wheel, which is said to f quently give months of service. I wheel cutter will cut solid round bleaving a negligible amount of burn.



Beaver Automatic Spring-Fed Knife Cut

The wheel-and-roller cutoff will pipe from \(\frac{1}{6} \) in. to 2 in. or solld robars from \(\frac{1}{6} \) in. to 1 in. It is manually by means of a large star wat the operator's right hand. wheels and rollers used are stand The cutoff device is attached in manner that it can be removed by ening one screw, for cutting lengths close to the chuck.

The automatic spring feed knife of will cut 1/4-in. to 2-in. pipe. K

PROVIDENC PRECISION DRILLS

Here are tools of true PRECISION quality, at no extra equally well adapted to the finest toolroom work and to quality of the production. Powerful, speedy, sensitive—they will reduce costs by giving you THE LEAST COST PER HOLE.

BALL BEARING THROUGHOU

High grade ball bearings at EVERY ROTATING practically eliminate wear—increase sensitiveness—prevention and chatter—maintain accuracy and rigidity power—simplify lubrication—assure PRECISION results. Four models, 1 to 6 spindles—belt or motor driven—hower feed—for drilling, boring, tapping or reaming. Write for the Bulletin.

Providence Engineering Works, 523 SO. MAIN ST. PROVIDENCE

AVE YOUR \$KILLED MEN for Other MORE PROFITABLE Work

Anyone in your shop—even the "handy man"—can do a metalcutting job that will surprise you for speed, accuracy, and economy, when you use the HORIZONTAL-NAPIER Continuous Band Saw Machine.

Adjustable roller guides assure a "square" smooth cut. Floating gravity feed maintains correct, even pressure. Adjust vise jaws for the work at hand and let the machine run. "watches" itself.

A size to fit your needs—either direct or belt driven—at a price to boost your profits.

HORIZONTAL NAPIER Continuous Band Saw Machine

Setting Time Cutting Time Machining Time Stock Curb Wastes Rejects Labor Costs Maintenance Costs Time Down" Losses Blade Expense Power Expense Depreciation

SOME PROMINENT USERS

Ford Motor Co. Ford Motor Co.
Burroughs Adding Machine Co.
General Electric Co.
Chase Metal Works
Lima Locomotive Works
Allen Manufacturing Co. Bethlehem Steel Co. Crane Co. Timken Roller Bearing Co. Crucible Steel Co. of America Fisher Body Co. National Twist Drill & Tool Co.

Insist on NAPIER BAND SAW BLADES-

for ALL metal-cutting band saw machines

For chart showing correct pitch and temper band saw blade for every kind of metal cut-for solutions to your metal-cutting problems—for price and specifications of HORIZONTAL-NAPIER Continuous Band Saw Machines

Write or Wire

SAW & MACHINE CO.

40 NAPIER ST., SPRINGFIELD, MASS.

feed automatically and cut square without leaving burr. No gage is required to set the knives. A safety guide ahead



Beaver Wheel-and-Roller Cutoff

of the cutting edge on the knives controls the depth of cut and makes it impossible for the knives to "hog in". Self-centering V-jaws support the pipe while cutting, and prevent chattering. The knife blocks, backed by heavy springs, cushion the shock when cutting out of round pipe, and prevent knife breakage. The cutter is operated by a large star wheel at the operator's right hand.

Skilsaw 7-In. Disc Sanders

Skilsaw, Inc., 3334 Elston Ave., Chicago, Ill., has augmented its line of Skil-

saw portable electric tools by the addition of a "-in. disc sander made in two models, one for heavy duty and one for constant production service.

The sander is built into a body of streamlined design and is said to be perfectly balanced and of unusual light weight. Comfortable grip handles assure complete control under heavy sanding loads. An efficient air filter protects the commutator and motor from abrasive dust and dirt. The motor has ample reserve power to insure a long life and provide the maximum of speed in sanding and grinding.

Straight-line ventilation assures a cool-running tool. Ventilating ports are located so as to blow the dust away



Skilsaw 7-In. Disc Sander

from the operator and prevent clogging. All ball bearings are fully sealed against dust and grease leakage. The bevel

METAL SAW BLADES



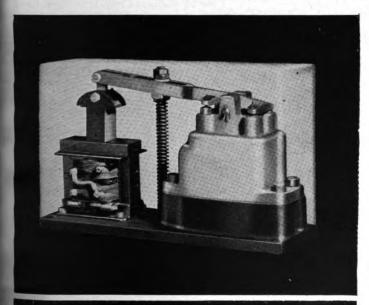
Solid or Inserted Tooth Circular Saws. In all standard sizes to fit any cold saw machine.

Made of extra tough steel to give greatest value metal cutting. Write for prices and further details.

SIMONDS

SAW and STEEL Co.

FITCHBURG, MASS. CHICAGO, ILL.



ROSS Operating Valves

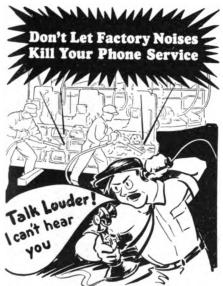
The valve shown is Model 4-PS, Four-Way Solenoid Controlled, for the control of Double Acting Cylinders. Simple in design-lightning swift in operation. The fastest operating valve on the market. All ports on one face, making installation and servicing easy. Made in hand, foot, mechanical and solenoid controlled types, for the control of both single and double acting cylinders.

Write for new catalog.

ROSS OPERATING VALVE COMPANY

6488 Epworth Blvd.

Detroit, Michigan



Try the Amazing BURGESS Acousti-Booth for 10 Days!



You can telephone in the noisiest factory without interference with this new open telephone booth. The secret of its quietness lies in the patented acoustic lining. As no door is needed, the booth is always well ventilated. It is easy to use and easy to clean. This all-steel booth will withstand the roughest service. Mail the coupon.

If not satisfied return at our expense

Licensed under C. F. Burgess Laboratories, Inc., Patents

Burgess Battery Co., Dept. MM 111 W. Monroe St., Chicago, Ill.
Please send Bulletin 126 and details of special 10-day trial offer.
Name
Company
Address

gearing is sturdy and quiet in operation.

The heavy duty Model G 7-In. Di Sander is 16¾ in. long and weighs 12 lbs. The continuous production Mod L is 16¾ in. long and weighs 14 pound

Porter-Cable Portable Belt Sand

A four-inch, heavy duty, portable dustless Take - About sander-grinder Type T-4V, has been announced by the Porter-Cable Machine Company, Syncuse, N. Y. This machine was designer and built to perform heavy, constant



Porter-Cable Portable Belt Sander

sanding and grinding operations. It equipped with a 1½ h.p. universal me tor mounted parallel to the sanding be shoe. The frame is made of aluminur alloy for lightness and portability. As ample motor cooling system is provide through a gridded intake at the from a commodious air circulation chambe exhausting through a grid on each sid at the rear.

Between the rear end of the trans mission and the guiding handle, a pow erful vacuum dust collecting system installed. The vacuum intake extend across the full four-in. width of thabrasive belt, drawing up the dust into a dust bag equipped with zipper opening for emptying.

The abrasive belt operates flush with the right side of the frame to workight up to upright objects. A flat lever-type adjustment allows for instantaneous belt change. The transmission consists of worm and worm geal



■ The steel part illustrated has been enlarged three diameters to permit comparison of the original finish on a Union Cold Drawn Bar with that of machined surfaces. Both types of finish are equally high grade—all sections of the part are accurate.

Union Cold Drawing thus eliminates one or more operations in the manufacture of many steel parts. No machining is needed where the bar surface can be retained in the completed work.

Watch your machining costs. Use a steel that comes to you accurately sized and smooth finished for making your production easier and less costly.

There is a Union Drawn Distributor close by ready to give you the best steel service.

Union Cold Drawn Steels

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of high helical angle. The worm may be inspected through a large opening in the top of the frame. The abrasive belt size is 4 in. wide x 27-in. circumference.

Uses for this portable sander are numerous, among them being resurfacing of school desks, tables, cabinets, sash doors, boats, and so on, and for grinding down metal strips, plates, grills, and other metal parts. For the honing of marble edges, resurfacing slate blackboards, smoothing glass edges, and sanding or grinding composition materials, including plastics, this new sander is said to do a quick, smooth job.

Sunnen Spring Tester

In view of the fact that car manufacturers have been increasing valve spring tensions in order to insure correct valve operation at the high motor speeds now in use, a demand has been created for an accurate spring testing machine and this demand is now being met by the Sunnen Products Company, 7903 Manchester Ave., St. Louis, Missouri.

With the Sunnen Spring Tester the valve or clutch springs can be checked in a few minutes, giving a direct reading in pounds. Valve springs in any

motor can be tested without remot the head, excepting Fords and V-t motors having blocks set closer t 90 deg. On these jobs it is neces



Sunnen Spring Tester

to remove the springs and test in the Sunnen Spring Holding Fix
The Sunnen Spring Tester is of ple design and easy operation. A sion data book is supplied giving correct pressures in pounds for in closed or open position in the i



Wahlstrom Chucks

FULL AUTOMATIC



Don't Stop the Spindle

With spindle speeds up to 10,000 R.P.M., drills in the Model "A" type chucks can be inserted and removed without stopping the spindle. Capacity: 0" to 3/16", 1/64" to 3/8", 1/32" to 3/4".

The Model "B" for straight shanks is of the eccentric roller type design. A powerful chuck for deep drilling. Only three sizes to cover a range 15/64" to 1". Operates without stopping the spindle.

Write for Circulars



Wahlstrom Tool Division American Machine & Foundry Co. 5502-5524 Second Ave., Brooklyn, N.Y.



and the correct pressures when testing out of motor, on practically all makes and models of cars.

Bowgage Independent Wheel Head

An independent grinding head which can be applied to a plain grinder for automatic grinding wheel feed, and known as the "Bowgage", has been brought out by the Fitchburg Grinding Machine Corporation, Fitchburg, Mass. This is said to be a self-contained independent grinding wheel head unit with all movements and controls self-contained. The head has rapid traverse, slow grinding feed, grinding dwell or spark-out, and rapid return to starting position, all started by one push button.

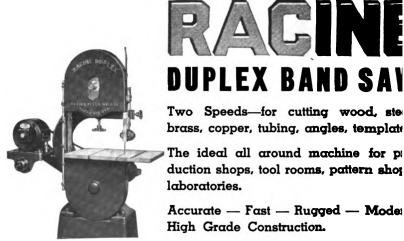
The rate of grinding feed is controlled by a hydraulic metering valve through a dial on the panel. The dwell is governed by a Telechron clock-controlled time delay switch. Another graduated dial, operated by a small hand wheel, can be set for the amount of stock removal, with a maximum of 1/8 in. on the diameter. The rate of rapid traverse is constant and the amount is set at the factory anywhere between zero and five inches.

The principle of the wheel feed is a



Bowgage Independent Wheel Head

toggle and this toggle action is obt by the movement of a leaf spring. spring is located horizontally bet the wheel head and the wheel slide. One end is attached to the and the other to the head under sion and in a bowed position whel wheel head is at the start of the By hydraulically flattening move



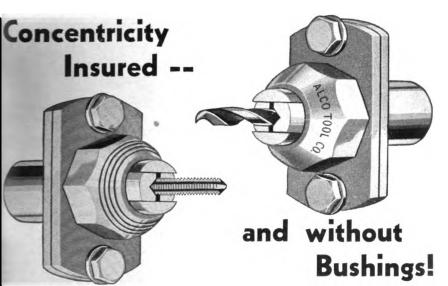
INE DUPLEX BAND SAY

Two Speeds-for cutting wood, ste

The ideal all around machine for p duction shops, tool rooms, pattern show laboratories.

Accurate — Fast — Rugged — Mode High Grade Construction.

RACINE TOOL & MACHINE 1770 STATE ST. RACINE, WISCONSIN



Two features which, alone, make the New ALCO Drill Chucks and Tap Holders an outstanding buy for all Screw Machine Owners

These new tools will accomplish what has never heretofore been accomplished with drill chucks or tap holders. Construction is simple; adjustment is easy and positive; a wrench is the only tool required.

Lost time and costly idle machines, when looking for bushings, will cease to be a source of worry to you . . . and think of the money you'll save by eliminating your tool room troubles and wiping out your bushing costs and inventories.

Your experience must convince you that you should write immediately for details.

ALCO TOOL COMPANY

BRIDGEPORT

PATS. PENDING

CONNECTICUT

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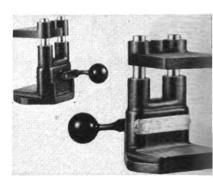
the spring elongates and this elongation feeds the wheel head forward.

In this movement, there are no joints or bearings to eventually produce backlash. The feed motion is relatively fast at the start of the feed and gradually slows down at sizing position which makes an ideal grinding condition. As the wheel moves into the final sizing position, the ratio of the vertical movement to the horizontal feed movement is approximately 250:1.

The head is built for either right or left hand wheel mounting and since the unit is independent, it may be placed anywhere on the machine. The grinding cycle may be changed by a touch of the dials for whatever conditions the operator meets. The feed movements can be controlled in ten thousandths of an inch. If the wheel feed dial is moved one ten thousandth of an inch, one ten thousandth indicator reading on the head movement is obtained.

Esco "Litewate" Drill Jig

To meet the demand for a universal drill jig with the Esco features but designed for a broader range of application than has been possible with the previous Esco jigs, Esco Engineering

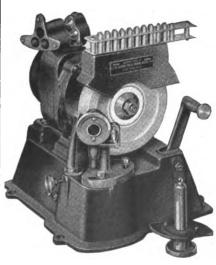


Esco "Litewate" Drill Jig

Service Co., 3120 Monroe St., Toleo Ohio, has brought out the "Litewa' Drill Jig shown in the illustration

The new features of this jig are weight and clamping pressure. Tweight is 11 lbs. and the clamping presure is adjustable from a few ounce to a maximum of 70 pounds.

The usual type of Esco locking appearating mechanism, consisting of a centric gears and spring follow-up the guide-posts is employed.



BE SURE

OF ACCURATE GRINDING Grind your Small Drills on a "BLACK DIAMOND"

This is the only grinder that accurately grinds all sizes of drills from No. 60 to ½" without complicated adjustments.

The savings that result from BLACK DIAMOND grinding quickly pay for the cost of the machine.

Try a BLACK DIAMOND in you shop—know that your drills are being accurately ground.

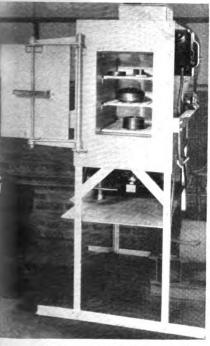
Write for Bulletin

BLACK DIAMOND

SAW & MACHINE WORKS, INC. 45 North Ave. Natick, Mass.

Lindberg Furnace for Toolroom

The Lindberg Engineering Company, 22 N. Lafin St., Chicago, Ill., announce addition to the line of Cyclone it has the same operating sinciple as the standard Cyclone, it is ot a production furnace, but a box



Lindberg Furnace for Toolroom Service where the work is charged and removed, piece by piece.

The method of construction is simiar to that of the production Cyclones. The air is driven by a powerful blower fan through the electric heating ele-ments, and into the top of the work chamber, where it passes down through the charge and returns to the fan through a perforated metal bottom plate.

Several shelves are provided in the work chamber to hold small parts when tempering. These shelves can be removed when large parts are to be treated. The furnace door is of the plug

YOU FIGURE IT!

1. Number of gallons of cutting oil you use each

2. Cost of your cutting oil

per gallon. 3. Savings from reclaiming up to 97% of oil

used.

. . . yes, figure it. Number of gallons of cutting oil you use each day-times its cost per gallon. Then figure how much is reclaimed, how much is lost. Expensive outgo? Well, remember, in hundreds of plants every day Tolhurst Chip Wringers reclaim up to 97% of oil used-savings that return their purchase price many times over annually. Bulletin CW-37 gives complete data. Write for it.

TOLHURST Centrifugal Division

American Machine and Metals, Inc. 100 SIXTH AVENUE. NEW YORK, N. Y.

type, and is specially hinged so that it can be readily withdrawn and swung away from the opening, the hot face of the door being always away from the operator.

These box type Cyclone furnaces are made in several sizes for applications in tempering either to 800 deg. F., or to 1200 deg. F. They fulfill a real need in modern tool room practice of supplying a rapid and convenient method of tempering individual pieces or small group parts without resorting to expensive equipment.

Diehl Six and Seven-In. Electric Grinders

The illustrations show the sizes of electric grinders which have been placed on the market by Diehl Manufacturing Company, Division of The Singer Manufacturing Company, Elizabethport, N. J. These grinders have been designed to meet all requirements for small tools and miscellaneous grinding. The motors were developed especially for grinder service and are sturdily constructed, well insulated, bearings and windings are well protected against dust, and the careful balancing of motors and use of oversize dust-sealed ball bearings assure

smooth operation. Adjustable wiguards and tool rests make the grin readily adaptable to different kinds



Six-In. Clearance Type Electric Grinds Seven-In. Heavy Duty Type Electric Gr

work. Grinding wheels are said to of high quality and operate at a s of 3450 r.p.m. The grinders are plied in attractive blue enamel fi which will not readily crack, chip peel. Fittings are nickel plated.

The six-in. "Clearance Type" Grihas a heavy cast iron base with ru feet and a handle for carrying. It





Compared with rough cast bars, Bunting Machined and Centered Bearing Bronze Bars save more than the metal costs in set-up and machining time. 131 stock sizes.



D^O as so many others do—buy bearings as you need them—let Bunting carry the stock.

Over 600 different sizes of bearings you most frequently require are available instantly in any quantity at any time, completely machined and finished ready for assembly.

Bearings for service replacement in electric motors of all makes and models from 1/40 hp to 60 hp are obtainable from stock as needed.

Write for one or more copies of the Bunting Catalog that takes the place of an expensive inventory in thousands of plants throughout America Today . . . The Bunting Brass & Bronze Company, Toledo, Ohio. Branches and Warehouses in All Principal Cities.



Quality

MACHINED AND CENTERED BRONZE BARS

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be plugged into any 110 volt, 60 or 50 cycle alternating current circuit. Steel wheel guards are adjustable to permit working over the entire circumference of the wheels and the tool rests may be adjusted to compensate for wear.

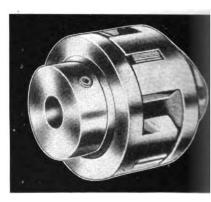
Motor is ¼ h.p. Equipment includes
two 6x34-in. grinding wheels, one Net weight, 28 coarse and one fine. pounds.

"Heavy Duty" Туре The seven-in. Electric Grinder has a heavy cast iron base with case iron wheel guards which can be adjusted. Tool rests may be adjusted to compensate for wheel wear and the grinder is finished in blue enamel with nickel fittings. The motor is ½ h.p., totally enclosed. Equipment includes two 7x1-in. high quality grinding wheels, one coarse and one fine. Net weight, 65 pounds.

A pedestal suitable for either the Clearance Type or Heavy Duty Type Grinder is available. The pedestal is also finished attractively in blue enamel.

Waldron Fractional Horse Power Flexible Coupling

A new Francke All-Steel Fractional Horse Power Flexible Coupling has been added to the line of Francke couplings



Waldron Fractional Horse Power Flexible Coupling

built by the John Waldron Corportion, New Brunswick, N. J.

This coupling is recommended if fans, fuel pumps, generators, etc. up 3/4 h.p. at 1800 r.p.m. and for shat up to 3/4 in. diameter. It provides frand independent lateral floating of the state of the st connected shafts, accurate alignme surfaces, an assembled one-piece a



Before

GOOD





After

AT 20% TO 60% LESS

The National Tool Salvage Co. will grind your worn and broken tools to original accuracy, retaining their temper and guarantee them to be as good as new.

Illustrations show a plain mill before and after recutting by the N.T.S. method at a saving of 20% to 60%. Send a trial order today. We pay shipping charges one way. Write for our 18 page illustrated catalog.

NATIONAL TOOL SALVAGE CO.

DETROIT

MICHIGAN



For Better Filing Results!



The quality of a file job that a man does depends very greatly on his ability to select the proper shape and cut of file. There are literally thousands of different types in various grades and sizes. Unless you have investigated the subject most thoroughly we are confident that we can make recommendations which will be for better results in your special class of work. The particular file for that particular job pays handsomely.

Be sure to specify SUPER-DUTY Files for the assurance of the utmost in quality. The complete SUPER-DUTY line is ever built to a standard but never to a price—and that standard has prevailed since 1899. There are several "semi-special" SUPER-DUTY Files which are certain to go far in solving some of those particularly troublesome filing problems. Ask us or our distributors for complete information.

SUPER-DUTY Files are sold only through recognized Mill Supply Distributors. Specify them on your next order and start cutting your filing costs with these "Superior Production Tools."





Improved Expanding Rubber Drums . . . accurately balanced . . . precision built. Several types for use with different styles of spindles.

Sleeves of new lapless construction . . . last longer . . . do not ravel . . can be run in either direction.

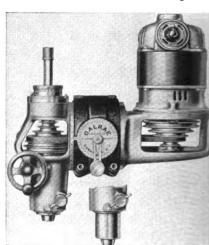
R. G. HASKINS CO. 4667 W. Fulton St. Chicago



steel center member, large load carring surfaces, is torsionally resilient, muchanically flexible and silent at ar speed. It is fully described in Franci Bulletin No. 53, a copy of which will sent to any reader upon request.

Dalrae Midgetmill

The Dalrae Tools Company, 313 Syrs cuse Bldg., Syracuse, N. Y., announce an addition to its line of speedmill The new unit has the high speed spin dle housed in a hardened and groun



Dalrae Midgetmill

quill, having a 2½-in. travel. Boring and drilling feeds are obtained with hardened worm and bronze worm whee with internal screw thread which fit accurately a ground screw thread on the quill. Extreme smoothness of feeding action is claimed. The ground steel sleeve and quill members give added rigidity that eliminates chatter and vibration under maximum cuts regardless of spindle position.

Other features common to the standard speedmill—balanced design, flywheel type of spindle pulley, spindle lock ejector rod, self-contained plumb bob. single mounting for any compound angles, light weight characteristics—have been retained.

An ingenious depth stop that "clicks" a warning when desired depth is reached replaces the usual solid depth stop thereby effectively eliminating cramping precision ball bearings. It is claimed



High Speed — High Production

SMALL TAPPING

with

Sensitive - - - Multiple Spindle

TAPPING HEADS

Ettco-Emrick multiple tapping heads are all together a different proposition.

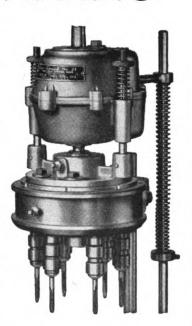
Multiple tapping, the ETTCO WAY, is successful tapping.

Once you get started they become a standard shop tool.

They are made up from assembled units, from stocked, standardized interchangeable parts. And some brains and a lot of experience go along with them.

Let's have your blueprint or sample for a quotation on a standard priced form.

MULTIPLE HEADS ON THE TAPPING MACHINE IS THE FASTEST KNOWN MEANS OF MANUAL TAPPING. A FELLOW AROUND THE CORNER IS TAPPING 9000 HOLES PER HOUR—SO CAN YOU IF YOU HAVE THE JOB.



A new ETTCO development is tapping one hole pieces with a two spindle head using both hands to feed. The result is twice the production over your present method.

ETTCO TOOL CO.

596 Johnson Ave., Brooklyn, N. Y.

that exceedingly accurate settings are possible. A standard 40 threads to the inch micrometer dial of large diameter for setting is precision-built and dependable.

Thor Electric Screwdriver

The tool illustrated is a Thor "One-Hand" Electric Screwdriver which has been placed on the market by the In-



Thor Electric Screwdriver with Adjustable Slip Clutch

dependent Pneumatic Tool Co., 610 W. Jackson Blvd., Chicago, Ill. The tool is of small, light but sturdy construction and is built to drive all sizes of screws from No. 4 to No. 12. The design of the tool is such that the bulk of the weight is concentrated right at the op-

erator's hand, giving it a balance whis invaluable in actual practice. A pented ventilating system reduces heat to the minimum, and accurate machined heat treated helical gears duce noise and vibration.

With each screwdriver is inclusinders and bits for the entire drivering from No. 4 to No. 12, each which can be changed in a mometime. The tool is equipped with Thor No. 257 Slip Clutch Attachm The tool is 10½ in. long and weigh pounds.

Onsrud Model E-1 and Mode MD-1 Air Turbine Grinders

The line of air turbine grinders m by the Onsrud Machine Works, I 3916 Palmer St., Chicago, Ill., has t augmented by the addition of the M els MD-1 and E-1, illustrated herew The Model E-1 Grinder developed h.p. and 38,000 r.p.m. on 90 to 100 of air pressure, and is designed for grinding of forgings, large dies, similar work. As can be noted i the illustration, the shape of the is such that it easily fits the opera hand. It is of sturdy construction.



You don't need an X-Ray eye or an uncanny sense of judgment to select perfect end mills on sight alone. The "PUT-NAM HI-SPEED" trademark on any end mill is positive assurance of fast, accurate cutting performance and long, trouble-free life. One trial will convince you that PUTNAM END MILLS will meet YOUR most exacting requirements—and also effect real production savings. Catalog No. 3 lists the entire line of PUTNAM TOOLS. WRITE FOR IT:

"Putnam HI-Speed" I Stamped in the Metal of Every Putnam Tool. Look For it!

REAMERS COUNTER PUTNAM TOOL CO.

END MII



These two 7 in. SKILSAW Disc Sanders incorporate everything that is new in fine portable tool construction. Their compact streamlined design, power and engineer, ingrefinements bring a new standard of performance to this field. Compare every feature and you will choose one of these tools for all sanding and grinding work now done by slow, costly hand methods. See them at your distributors!

SKILSAW, INC.

Dept. E. 3314 ELSTON AVENUE, CHICAGO 210 E. 40 h St., New York 52 Brookling Ave., Boston Ample reserve power to insure long life. Provides for faster sanding and grinding.

SEALED BEARINGS-

Ball bearings, in all positions, are fully sealed as a protection against dust and grease leakage.

BEVEL GEARING— Sturdy and quiet in operation.



Says the Standard Dial Indicator

STANDARD Dial Indicators retain their accuracy far longer than ordinary gages because their new "Shockproof" construction protects delicate mechanism.

If you are looking for a Dial Indicator that can take rough treatment and still give accurate readings, then try the STAND-ARD.

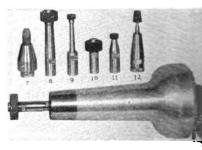
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For Better Gaging come to "Standard"

STANDARD GAGE CO., INC. POUGHKEEPSIE. NEW YORK

housing is of duro-aluminum, the spi dle is of nickel steel, heat treated a ground, and the rotor is of aluminy bronze.

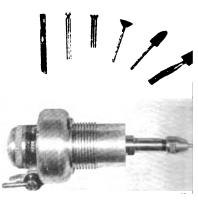
The Model MD-1 has been on market, but has been redesigned to



Onsrud Model E-1 Air Turbine Grinde

tain the "stream-line" effect and eliminate sharp corners. This tool also now fit into the operator's he as shown. This tool develops ½ and 50,000 r.p.m. on 90 to 100 lbs air. It has the same construction is of the same material as the ME-1.

An outstanding feature of the t



Onsrud Model MD-1 Air Turbine Grin

is the lubricating system, which the centrifugal force type. The sp is filled with fine oil, and centri action feeds this oil through resis elements to the precision ball best in a film, thus insuring adequate proper lubrication when the torunning and none when it is idle; there is no danger of overheating result of over-lubrication.

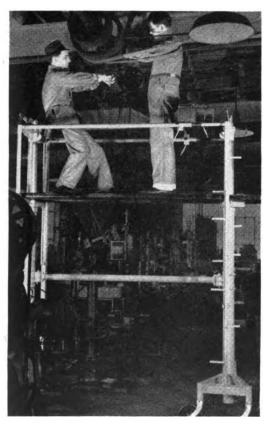
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skinner Chuck to hold a job with a fast, sure grip. . a grip that remains true under the toughest operations. . a grip that makes possible the most exacting micrometric accuracy. With a Skinner Chuck the South Bend Lathe operates within the extremely close limits so necessary for perfection in tool room work. On the South Bend Precision Lathe—on all modern, fine machine tools, employ positive acting, thoroughly dependable Skinner Chucks.

KINNER CHUCK CO. NEW BRITAIN, CONN.

LATHE • DRILL • PLANER CHUCKS CONTROL OF POWER CHUCKS



DecoVator Hydraulic Scaffold in use.

Onsrud air-drivel tools, the bearings are kept cool by expanded exhaust air.

Decovator Hydraulic Scaffold

A demountable hydrauli scaffold that may be raised lowered, extended or contracted, and driven from one van tage point to another by me chanical means actuated from the working platform, appear destined to put new flexibility speed, economy and safety int shop, factory and buildin maintenance operations where work must be done at varyin heights.

The new scaffold, calle "DecoVator" is made by th DecoVator Scaffolding Corpor ation, 2988 E. Grand Blvd Detroit, Mich. The scaffold is made entirely of steel, is ligh in weight, and its parts ar easily disassembled and transported for quick assembly a distant jobs.

In its assembled state, the DecoVator scaffold provides it own ladder as well as benche for tools and materials, and the complete lifting and traveling mechanism. The "reach of the hydraulically raised an lowered platform is consider able; one DecoVator model if from 2 ft. 8 in. in the lowes position to a height that will enable a man to work comfor tably up to 16 ft. For a second model the low point is ft. 2 in. and men can service work up to 22 ft. high.

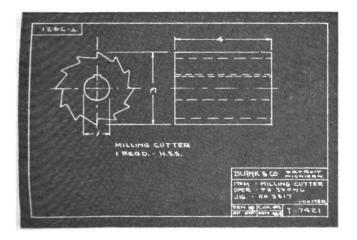
The platform is elevated be the worker upon it at the rat of 8 ft. per min. and lowered at 10 ft. per min. The enscaffold structure, which come

at 10 ft. per min. The en tire scaffold structure, which come with rubber-tired wheels, may be jock



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Just some teeth around a blank



That to some people is a milling cutter and is comparable to designing an automobile by putting four wheels on a box.

For maximum efficiency, milling cutters must be engineered.

Let us study your problems.

GODDARD & GODDARD CO.

Milling Cutter Engineers **DETROIT**, MICH.

eyed from above, in any direction, at a ground speed of 50 ft. per minute.

The ease with which the new hydraulic scaffold is transported, and the one-man control by which it is adjusted to different levels and moved about horizontally, seem to put the DecoVator definitely in the light of an equipment addition for which many profitable uses will be found.

Sundstrand WX Model Pumps

The Sundstrand Machine Tool Co., Rockford, Ill., announces a new line of pump units, their WX models, which are especially designed for arbor presses, clamping fixtures, indexing devices, clutches, brakes, and so on. The units are built in several sizes.

Quick action for the approach and return of a ram or clamping member is taken care of by a large capacity Sundstrand Rota-Roll Pump with a small sized pump of the same type producing the clamping or working pressure. The output of the small pump only is bypassed against the working pressure. All control valves for the two pumps as well as both pumps are contained in one housing and operated by a remote pilot valve which may be manually or automatically controlled.

Of compact design, this arrangemen reduces piping to a minimum, also re sults in low power consumption and les

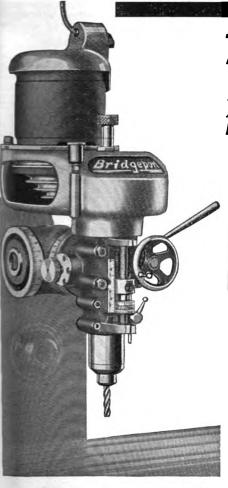


Sundstrand Model WX Pump

heating of the oil as only the smal pump is operated at the high working pressures.

Both of the pumps are mounted or the same shaft and driven at motol speed, 1200 r.p.m. The unit can be supplied with either foot or flang





THE BRIDGEPORT

for

HIGH - SPEED Milling, Drilling and Boring

AT ANY ANGLE

SAVE

On End Mills,
Hours of Labor.
Temper of Mechanics
working with old
sloppy spindles.
Special fixtures, Angle
Plates and Vises.

After seven years of continuous service The Bridgeport Attachments are still giving the same matchless performance. One company alone has forty-five of these machines in use in their die sinking departments.

A number of concerns use from ten to fifteen machines each for tool and die as well as production work.

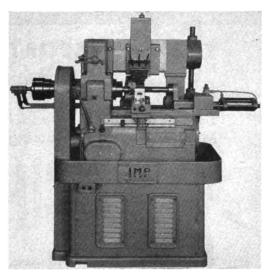
We doubt if we can overstate the value

of the Master Attachment for the small tool shop where a unit of this type will solve most of the awkward time eating jobs.

LET US tell you where a Bridgeport High Speed Milling Attachment may be seen in operation. Your time in viewing this equipment will be well spent.

Write for Illustrated Bulletin.

BRIDGEPORT PATTERN & MODEL WORKS



Lo-Swing Imp Lathe Equipped with Third Slide

mounting. An oil reservoir with motor base for attaching a foot mounted unit can also be furnished, together with any type of remote pilot valve that is desired.

Third Slide Now Available for Lo-Swing Imp

Seneca Falls Machine Co., Falls, N. Y. announces that a third slide or overarm is now available as a standard attachment for any of the new style Lo-Swing Imp Lathes.

The operation of this third slide is synchronized with the other turning and facing slides and is entirely automatic. It may be used for taking a finishing cut after roughing with tools on the rear slide or for chamfering and similar operations. The slide is heavy enough so that it may be used for a roughing operation, if desired.

Operation is by means of a cam on the main camshaft. Means are provided for quickly setting this cam so that the third slide may be timed to suit the particular job.

Safety Grinding Wheel & Machine Co. "Rite Speed Floor Grinder

The line of "Rite Speec Floor Grinders built by Tr Safety Grinding Wheel & Mac chine Co., Springfield, Ohi has been augmented by has been augmented by tŀ addition of the heavy dut grinder shown in the illustra The grinder is of tr general design as th same "Rite Speed" grinde: made by this firm, the out standing feature being the fac that an infinite number • speeds are available making possible to increase the spee of the machine gradually 8 the wheels wear, thus main taining the correct periphers speed at all diameters through out the range provided. Thi speed change is controlled b one hand wheel which is easil manipulated. The ability to ob the correct periphera wheel speed at all times in

sures better work, maximum production longer wheel life, safe operation, and th minimum of manual effort by the operator. The machine is powered with high power AC motors, and is made for 30 and 24-in. diameter wheels only.

The variable speed control is said to be a definite improvement over the stepped speeds formerly supplied.



"Rite Speed" Heavy Duty Floor Grinder

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OVERHEAD MATERIALS HANDLING

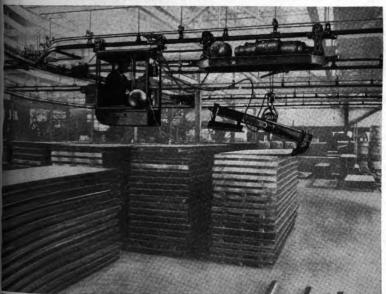


Photo 1554

The ability of Cleveland Tramrail engineers to design equipment and to plan or lay out a materials handling system, that will safely and successfully handle the intended loads and become part of the production process, is well illustrated in these installations of Motor operated carrier, hoist and grab; all operations of which are controlled from the cab.

Fhoto 1554 shows what is possible to accomplish by a little practice—this operator can pick up one sheet or full capacity loads—no floor man needed.

Consult your phone directory under Cleveland Tramrail.



THE CLEVELAND CRANE & ENGINEERING CO

1111 Depot St.

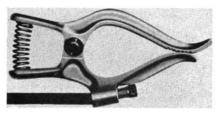
WICKLIFFE, ORIO

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Tweco Red Head Ground Clamp

186

A ground clamp for making proper grounds and cable connections to be known as the "Red Head" has been



Tweco Red Head Ground Clamp

brought out by the Tweco Products Company, Wichita, Kan. A quick, positive ground is said to be made with this type of ground clamp. It has a capacity up to 500 amperes and a jaw opening of $2\frac{1}{2}$ in. The length overall is 10 in. and the weight is 3 lbs. The spring tensioning member is completely insulated.

With the use of the Red Head Ground Clamp, are blow experienced in difficult welding positions may be reduced to a minimum merely by moving the ground. Current consumption is said to be and machine settings much lower with connection is maintained close to arc which is made possible and prical with a Tweco Red Head Port Ground Clamp.

Bristol Anticipating Device for Pyrometer Controllers

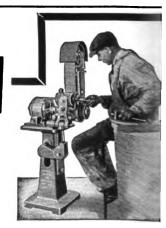
The Bristol Company, Waterl Conn., has perfected a device known the B-Linator for use with autor pyrometer controllers such as are on industrial heating furnaces. purpose of this device is to enable pyrometer controller to anticipate a perature changes and correct the consumption long enough in advance prevent the temperature from cyclin rising above and falling below the trol point as it does because of the trol point as it does because of the tral inertia offered by the mass of furnace and the load.

The B-Linator can be used with retically all of the commonly used to of pyrometer controllers and can added to present installations as as incorporated in the control circu new equipment. It has the abilit anticipate temperature change to and thus enables the control equipment.

4 MACHINES FOR THE PRICE OF

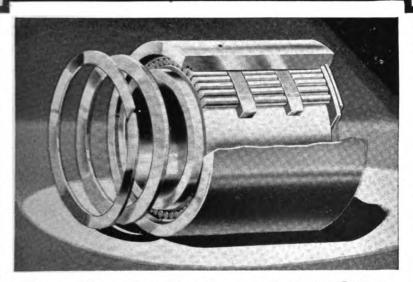
The Production Polisher and Surfacer is a machine of many uses. It combines—a Centerless Feed Polishing Machine—a Vertical or Horizontal Belt Grinder—Surfacer or Polisher—an Internal Grinder or Polisher. For cylindrical polishing and straight line finishing on flat work, it has no equal. Suitable for metal, rubber, fibre, wood, or anything that can be ground or polished.

Write for complete information on the Type S Production Polishing Machine.



IT'S A "HANDY MACHINE

PRODUCTION MACHINE CO., Greenfield, Mas



You Can Do Better with McGILL

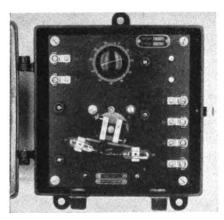
The Precision Needle Bearing

F OR great load capacity in small radial space, nothing equals McGILL MULTIROL Precision Bearings. Especially under sustained heavy or intermittent shock loads they far outrun plain bearings and frequently other anti-friction types—proven in thousands of installations since their introduction eight years ago.

McGILL MULTIROL Bearings are adaptable to many different applications in practically every type of equipment requiring radial bearings. Stocked in standard sizes from % to 6-inch bore, single and double rows of rollers, at low, volume production prices. Corrosion and heat resisting types and special designs engineered to order. Send for MULTIROL Bulletin.

MIGILL MANUFACTURING CO.

1500 N. Lafayette St. VALPARAISO, IND.



Bristol Anticipating Device for Pyrometer Controllers

to smooth out the usual wavy control record to a straight line.

The B-Linator through a switching

The B-Linator through a switching device adds or subtracts an emf to the regular thermocouple circuit to cause the controller to act in anticipation of a temperature change. The auxiliary

emf is derived from thermocouples in the B-Linator case connected in series but opposing each other. The magnitude of the emf produced by these thermocouples is dependent on the temperature change trends. The varying emf produced by the B-Linator annexe the anticipating feature of the control apparatus, enabling it to maintain close temperature in the furnace.

"Load Lifter Junior" Hoists

Two new small low head-room typelectric hoists, built in sizes to lift 35 and 700 lbs., have been placed on the market by Shaw-Box Crane & Holst Co. Inc., Muskegon, Mich., under the tradename "Load Lifter Junior".

The hoists are replicas of the large capacity low head-room electric hoist manufactured by this firm. With them the distance from the bottom of the track on which the hoists operate the hook when in its highest position is less than that of a chain hoist suspended from a trolley, being only 123, inches.

These small hoists have a lifting speed of 20 ft. per minute with rated capacit loads, and give a hook lift of 18 ft Control is by push buttons contained in

THE NEWEST DEVELOPMENT IN

METAL CUTTING MACHINES

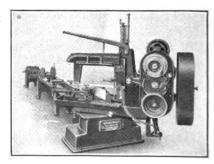
FULL AUTOMATIC-CAPACITY 10"x10" & 6"x6"

Stops when desired number of pieces have been cut. Length of cut is gauged by scale without end stop. Swivels on base for angular cutting.

Also built for manual operation.

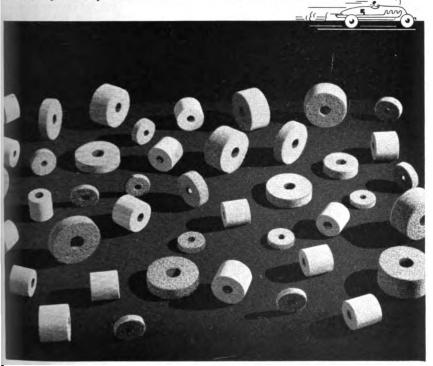
RASMUSSEN MACHINE CO.

RACINE, WIS.



Send for circulars giving complete information.

FOR A QUICK, SMOOTH-FINISH



Internal Grinding Wheels

• Here are small but important wheels which must be perfect as to size, grain and grade. Their work is done on small areas, their objects slight removal of material and an extremely high smooth finish.

Today our most modern method of making

these small wheels produces in thousands, internal wheels which have an extremely high production record and an action which leaves a finish as smooth as the finest mirror, accomplished by the correct proportions of grain and bond coupled with a specialized process of vitrification.

STERLING



ABRASIVES

THE STERLING GRINDING WHEEL GO., TIFFIN, O.

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MODEL "J" DOALL

slug with the DOALL Contour Saw - sawing at an angle-the slug may be used as the punch. On the same DOALL machine the excess material may be filed off to make the land on the die

and the straight sides on the punch. The sawing time on the 3" thick trimming die illustrated was 1 hour and 45 minutes.

MANY OTHER DOALL USES

"We have found three times as much work for the DOALL as we originally thought we would have."-R. H. Etter, Oliver Farm Equipment Corporation.

"We have had occasion to use the DOALL on quite heavy work and found that cutting steel 4" square by 24" long was an easy matter."-Carl M. Friden, Friden Calculating Machine, Inc.

TAKE THE JOB RIGHT THROUGH

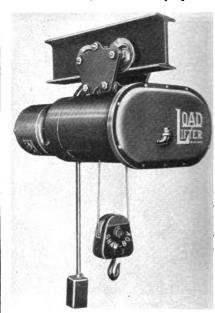
- 1. Send for advance announcement of the DOALL Metalmaster Models M and MD.
- 2. Write for Contour Sawing Handbook, sent free when requested on business letterhead.



CONTINENTAL MACHINE SPECIALTIES

a unit suspended from the hoists. Th hoists are comparatively light in weight weighing only 185 lbs. ready to operate complete with trolley.

Mechanically the hoists are of simpl design. The gear train consists of onl two gears and pinions. Ball bearing are employed at every bearing. The motor is of the totally enclosed babearing type. The hoists are equippe with two brakes; an electrically operate



"Load Lifter Junior" Hoist

motor brake and an automatic mechan cal load brake of the roller ratchet typ that controls the load during lowering so that the lowering speed is approx mately the same as the hoisting spee

The hoists are of totally-enclosed de signs, all parts being built into the hois frame. The gearing and mechanic load brake operate in an oil bath.

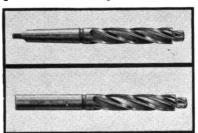
Putnam "Hi-Speed" Fast-Spiral Solid Counterbores

The Putnam Tool Company, 298 Charlevoix Ave., Detroit, Mich., has in troduced a new type of counterbook known as the Putnam "Hi-Speed" Fasi Spiral Solid Counterbore. One of th principal features of this counterboa

For **Power Transmission** or **Remote Control**---you can't beat the flexible shaft!



was developed for the purpose of permitting perfect seating of screw and bolt heads that might be slightly irregular in either shape or size.



Putnam "Hi-Speed" Fast-Spiral Solid Counterbore

To eliminate the need for trimming or other work necessary to allow the head to drop into proper position, this counterbore has diameters of both the cutter and pilot for body size holes that are 1/32 in. over listed sizes. To insure more efficient performance and longer life, the flutes are three times longer than those ordinarily used, and the chip clearance is greater in proportion to the diameter.

Fairbanks-Morse Heavy Duty Diese for the Small Power User

A new Fairbanks-Morse Diesel Engine the Model 42-E, has been developed by Fairbanks, Morse & Co., 910 S. Washas Ave., Chicago, Ill., to meet the deman of small power users for a heavy-duty continuous-service stationary engine. It is available in two and three cylinder combinations with ratings of 60 and 9 horsepower at 450 r.p.m., and can be furnished for direct-connected, belt of electric generator drive.

With an 8%-in. bore and 10½-in stroke, this Diesel is smaller and lighte than the F-M Model 32-E, but it embodies all of the proven features the have led to the daily use of several hundred thousand horsepower of the larger engines. It is small enough to be installed where space and head room are limited, and it is applicable for an power requirement within its horsepower ratings.

This new model Diesel is characterized by extreme simplicity of design and operation. Two important principles, direct airless injection of fuel and two cycle design with crankcase scavenging

CANEDY-OTTO

20" Sliding Head Motor Driven Drill For Production or Precision Drilling

Here's another rugged and well-balanced Canedy-Otto Drill—precision built from the ground up to give fast, accurate drilling. Vertical Motor Drive provides simplified construction. Driving units are completely equipped with Timken Roller Bearings, the motor and motor cone pulley with hall bearings, and the spindle cone with roller bearings.

Drills are equipped with push button control and magnetic switch. Desired belt tension is easily obtained with convenient, simple arrangement. Self feed is accurate and powerful. Four changes of feed can be had while drill is operating. Capacity for $\frac{7}{8}$ " drills without back gear— $1\frac{1}{4}$ " with back gear.

Furnished in single, two, three and four spindle type —15%" center distance of spindles.

Write for latest bulletin. "READY FOR THE JOB"

CANEDY-OTTO MANUFACTURING CO.

CHICAGO HEIGHTS

ILLINOIS

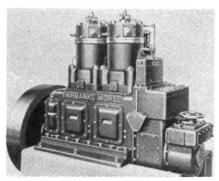




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Headquarters for: Drop-Forged Wrenches (Carbon and Alloy), Detachable Socket Wrenches,
"C" Clamps, Lathe Dogs, Tool Holders, Eye Bolts, Hoist Hooks, Thumb Nuts and Screws,
Chain Pipe Tongs, Vises, etc.

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2-cyl., 8 %-in. x 10 ½-in. F-M Model 42-E Diesel with a rating of 60 h.p. at 450 r.p.m.

result in use of an absolute minimum of moving parts. This, along with a medium-low speed, of course means greater reliability and lower maintenance cost.

The power impulse on each downward stroke assures a uniform output without need for an abnormally large flywheel. Cylinder heads are simplified by the elimination of air inlet on exhaust valves with their attendant operating mechanism. All working parts are enclosed, yet are readily accessible for its spection and maintenance. The engines are conservatively rated as to capacity, piston speed and bearing presures, and will operate continuously a rated capacity with no danger of overheating or of strain to any part.

Type GLF Red Ring Gear Lappin Machine

A Gear Lapping Machine to be know as the type GLF, has been announce by National Broach and Machine Company, 11457 Shoemaker Ave., Detroi Mich. The primary function of the machine is the correction of spiral angle eccentricity, in volute curvature an tooth spacing in gears. These error which frequently appear after hest treatment, are among the greatest obtacles to quiet gear operation. The are corrected on the new GLF faster an with greater precision than has even been possible previously.

been possible previously.

The GLF being of simple machin structure is easy to set up. It is like wise more rigid and more durable that its predecessors. It utilizes the crosse

PULLMORE CLUTCHES

Used in Roustabout Cranes

In reply to our inquiry about their application of Pullmore Clutches, Hughes-Keenan write "We are using two of your Double-Type Pullmore Clutches on our Model MC-2 Roustabout Cranes. The right hand clutch is used for operating the hoist line and raising and lowering the boom, the left hand clutch is for swinging the boom to right or left. We are using Pullmore Clutches because they are very compact, give long service without adjustments, and we have found them very reliable in service."

Reliable, compact, durable, economical, Pullmore Clutches are readily adapted to a variety of design and service requirements. Twenty-six typical applications are shown in our new 24-page Booklet along with complete data on sizes, dimensions and capacities of Pullmore Clutches, and brief information on our O-C Toggle-Type and Spring-Loaded Clutches. Write for free copy today.

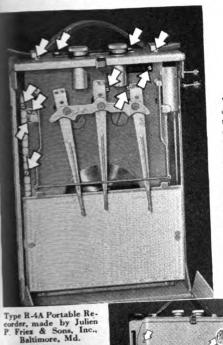


ROCKFORD DRILLING MACHINE DIVISION

Borg-Warner Corporation, 300 Catherine Street, Rockford, Illinois Sold by MORSE CHAIN CO., Ithaca, N. Y. Offices in principal cities



For assemblies as strong as these OME PAY 2 or 3 times AS MUCH



40 Fastenings on FRIEZ Portable Recorders

Assemblies include: attaching handle; name and specification plates; pen lifter mechanism brackets; pen lifter spring; running time electric unit; ventilating screen case back; door latch; unbreakable window; chart storage case. Also, fastening a Bakelite cover plate to a transformer box not shown. Let a Parker-Kalon Assembly Engineer help YOU do what "FRIEZ" did . . . produce a better product, at lower cost.

When FRIEZ engineers tackled the job of producing a sensitive humidity-temperature-running time recording instrument that would be rugged enough for portable service, assembly methods took on new importance. Fastenings had to stay tight. "Friez" was ready to pay a premium for maximum assembly strength. Yet, a comparison of methods showed that the simplest and cheapest means . . . Parker-Kalon Hardened Self-tapping Screws . . . actually would be the strongest, too. K. E. Whitney, Friez' Development Engineer reports: "Chosen for making fastenings to the die cast aluminum parts primarily to get safe fastenings, these Screws give us a fine saving as well. Had we used tapped holes and machine screws the cost would have been triple. Tapping for small screws would have been a real task and lock washers would have been necessary."

Use the specialized knowledge of Parker-Kalon Assembly Engineers

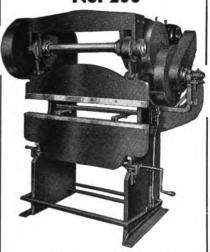
Whenever assembly of metals and plastics is involved, this method that is simpler. faster, cheaper and also more secure should be considered first in designing for production. Also, it deserves serious investigation even after production has begun. To substitute these unique Screws for ordinary devices requires no radical changes. Right now, in 7 out of 10-assembly departments there are opportunities to save time, labor, money, and to improve design and product. Ask us to have a Parker-Kalon Assembly Engineer go over YOUR fastening jobs with you, and better, at lower cost.

PARKER-KALON CORPORATION Dept. M, 198 Varick Street, New York

PARKER-KALON Modern FASTENING DEVICES

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CHICAGO STEEL PRESS No. 253



Does 40% to 60% of the forming work turned out by the average shop.

Here's a profitable, economical brake ideally adapted for rapidly forming metal sections such as in stoves, refrigerators, soda fountains, steel cabinets, metal furniture, steel boxes, and a great variety of sheet metal specialties. Its variable speed drive operates from 17 to 50 strokes per minute. The No. 253 CHICAGO STEEL PRESS is accurate, compact, and ruggedly constructed of highest quality materials.

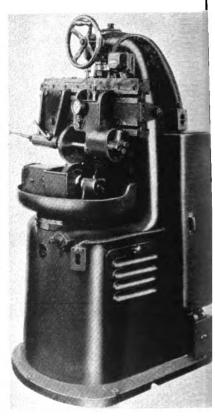
Sizes 4, 5 and 6 ft. capacities, up to 10 gauge.

Write for Circular No. 253

DREIS & KRUMP MFG.

7418 LOOMIS BLVD.
CHICAGO ILLINOIS

axes principle of lapping in which lap gear drives the work gear. Rotat of the lap in one direction processes side of the work gear teeth. Chang the direction of rotation processes other side. The angle between the we gear spindle and the lap spindle readily adjustable because the lap mounted on the machine table whi



Type GLF Red Ring Gear Lapping Machine

has a 15 deg. swing and a Vernier ad justment for close setting. Setting i provided for in front of the machine.

The work gear spindle is carried on a cross slide which automatically reciprocates the work gear across the face of the lap. This cross slide movement is actuated and controlled hydraulically which makes practically any lapping cycle easily available. The length, speed and number of strokes may be varied as

DO YOU LIKE Flat Wire WITH A SPRING-LIKE "FEEL"?

ity of our tempered High carbon Flat Wire has impressed and pleased a large number of occurs who are "hard-to-please" uyers of this product. Great reliberate straightness, and strict missinity of temper are among the conficient which this wire

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Roebling
COLD ROLLED
STEEL FLAT WIRE

It is a very tough, resilient wire ... very accurate dimensionally, free of defects on the surface and edges, has high tensile strength, and is uniform in temper.

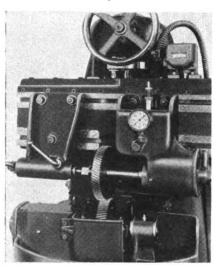
If you require cold rolled steel flat wire made up to exacting specifications...wire which calls for close attention to details and careful checking throughout production...it would pay you to investigate our product and our facilities. We specialize in this type of work and our organization is trained to handle it. We have had over 40 years of experience.

JOHN A. ROEBLING'S SONS COMPANY
TRENTON, N. J. Branches in Principal Cities



DOLY O FINE PRODUCT MAY BEAR THE NAME NOEBLING

will. Any given number of strokes may be made before the direction of lap rotation is changed—likewise any number after the change is made. The entire cycle is automatic, consequently each individual unit is processed uniformly.



Close View of Type GLF Machine Showing Gears in Process

This flexibility in cycle control permits, when desired, a greater degree of lapping on one side of the tooth than is given the opposite side. Thus drive gear teeth may be automatically brought to closer tolerances and smoother surfaces on the drive side, which is the more critical of the two.

A hydraulic brake, acting in conjunction with the work gear spindle is used to load this spindle and provide the necessary pressure between the teeth of

the lap and those of the gear. The pressure can be accurately regulated suit the need of the individual parting processed. The amount of press is indicated on the gage dial at front of the cross slide. The new Gwill accommodate gears up to 8 inclin diameter. Maximum lap face is inches. It rapidly produces an accur smooth surface on gear teeth.

B & D 6-In. Junior Ball-Beari Bench Grinder

The Black & Decker Mfg. Compa. Towson, Md., announces a new 6-Junior Ball-Bearing Bench Grind Sturdy and well-balanced for practishop use, it is perfectly proportion and handsomely finished in brillia aluminum. Powered by a stands Black & Decker constant speed motor full ¼ h.p. rating (except 25 cyc which is 1/5 h.p.) and can be obtain in all standard A.C. single phase wo ages and cycles. The grinder is equiped with full ball-bearings, which a protected against dust and dirt by special bearing sleeves.

The generous-size wheel guards a made extra-strong by the use of malloy which combines lightness withingh tensile strength. Ample room provided for the use of wire who brushes. The strong full-size tool reare firmly locked in base grooves be are easily adjusted to compensate f wheel wear.

The grinder may be bolted to the bench or moved to convenient location by means of the carrying handle, when the four rubber feet will act as stabilizers. Included as standard equipment are one fine and one medium when (each being full size 6-in. diameter 1%-in. face by ½-in. hole); also a three conductor cable (2 leads and 1 groun connection). The total net weight

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INDIVIDUAL, SELF - CONTAINED UNITS FOR

HOLE PUNCHING

EASILY ARRANGED FOR MOST GROUPINGS IN FLAT SHEETS

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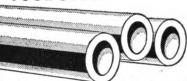
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Prompt shipments from stock in sizes up to 14" diameter and 2" wall thickness. Other sizes to your specifications. Investigate and save!

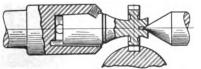
We also supply: Stainless Tubes, Aircraft Tubes, Mechanical Tubes, Pressure Tubes and Ball Bearing Tubes. Cold Fnished Steels.

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THE BISSETT STEEL CO. 943 EAST 67th ST., CLEVELAND, O.



Midwest tested taper and pin drive plus lock screw on taper



and Extended Center provide rigid support at both ends.

Eliminate Vibration and Slipping Permit Faster Speeds and Heavier Feeds

Send for complete Midwest Cutter Catalog

Midwest Tool & Mfg. Company

2358 W. Jefferson Detroit, Mich.



B & D 6-In. Junior Ball-Bearing Bench Grinder

 $31\frac{1}{2}$ pounds; overall spindle length, $12\frac{1}{4}$ in.; total height, 10 in.; height to center-line of spindle, $5\frac{1}{2}$ inches.

Spekflux

What is claimed to be the fastest acting hard solder flux for soldering, brazing or welding such metals as stainless

steel, steel, iron, copper, brass, bronze platinum, gold, silver, Monel metainickel and German silver has been placed on the market by the Special Chemicals Corporation, 32 Irving Plac New York, N. Y. The material, which is known as Spekflux, melts at low temperature, resists evaporation at high temperature, and the solder flows freely along the joint. The fluxing action starts at 212 deg. F. and has a flowing point from 785 deg. F. to 1600 deg. F and over. It does not evaporate at high temperatures and functions thoroughly and efficiently for high melting poin solders. Under all conditions the excessifux washes off quickly in hot water saving cleaning time. The quick action of Spekflux is said to save both laborand gas, generating a minimum amount of fumes.

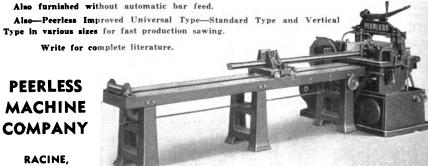
Detroit Universal Duplicator

A duplicating attachment which can be adapted to a milling machine, boring mill, lathe, shaper, or other machine tool for die sinking, die making, automatic turning, automatic shaping, and so on, has been developed by Glern & Anholtt Tool Co., Inc., 1312 Mt. Elliott Ave., Detroit, Mich. The outfit is portable, being supported by casters upon

New $6'' \times 6''$ Peerless Improved High Duty Metal Sawing Machine With Hydraulically Operated Automatic Bar Feed

Automatically feeds the bar of stock forward to the gauge, automatically closes the vise, and automatically continues to repeat the complete cycle of cutting until the entire bar is cut to the length the gauge is set for, all without the attention of an operator.

The three speed sliding gear transmission—crankshaft—balance lever and trunnion blocks are fully ball bearing equipped. The fastest cutting time possible at a minimum blade cost on any kind of metal because of its modern design and rigid construction.



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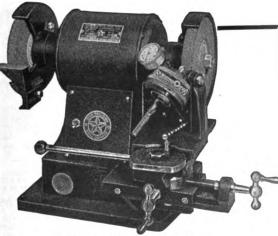
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Grinds 81 SIZES OF Drills

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This Star Precision Grinder puts drill grinding on a production basis. Its simplicity and accuracy saves as high as 50% on drill costs and insures uniform accuracy that guarantees perfect holes and increases production.

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STAR MACHINE & ENGINEERING CORP.

Division of Star Electric Motor Co.

NEW JERSEY

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which it can easily be moved from one machine to another. By the use of this duplicator a pattern can be used with a follower which controls the movement of the machine table in such manner that the shape and contour of the pattern can easily be duplicated by the

Milling Machine Equipped with Detroit Universal Duplicator for Reproducing Dies or Patterns

cutting tool of the machine. The duplicator is said to be capable of copying from a pattern or matrix to very close limits.

In operation, the duplicator is con-

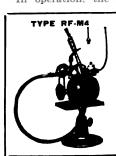
nected by means of a universal shaft t the lead screw of the machine, by which means the contour of the work is con trolled, the power for cross feeding be ing obtained from the machine itsel: The manufacturer states that the dupli cator is sufficiently powerful to operat

any size of boring mill an at the same time is sum ciently sensitive to operat the smallest machine with a high degree of accuracy

Westinghouse FlexArc Engine Driven Welde-

The FlexArc Engine Driver Welder shown in the illus tration, product of Westing house Electric & Manufac turing Co., East Pittsburgh Pa., is a sturdy, compac unit recommended for gen service and welding production work. The welde: self-contained and consists of a FlexAr generator directly welding coupled to a Chrysler Industrial Power Unit. The generator and power uni are assembled on a common welded base and enclosed in a sturdy sheet metal canopy equipped with split side covers hinged at the top so that they may be folded back, giving access to the power unit or generator Engine driven models are or generator available in either portable or stationary type, with or without auxiliary power generators.

The welding generator has a single bearing, the rear bracket being bolted direct to the engine. This construction eliminates one bearing and makes possible more compact construction as well as better shaft alignment





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Flexible Shafts and Machines FOR

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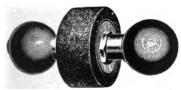
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ing won't warp so the adjusting nut never binds. Wide open, it doesn't clog with sand and mud.

Add to that the saving of 75% of your wrench repairs because of the unconditionally guaranteed housing; the no-slip no-lock replaceable jaws of chrome molybdenum alloy, hook jaw with handy pipe scale—a wrench that has earned its world-wide papularity.

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The welding generator is said to open on a new principle of magnetic contuitizing a magnetic shunt in the arture reaction flux path. By this me a generator which requires no shifled, no field rheostat, exciter or ternal reactor is obtained. This piciple permits accurate pre-selection welding current over a complete weing range by means of a simple pitive acting single dial mechanical circle, eliminating the need for rheost series field control schemes, or adjuable brushes.

The output current of the weld generator is adjusted by means of i



Westinghouse FlexArc Engine Driven Wei

leakage plates which are operated by hand wheel. These plates serve as magnetic shunt for the reaction flux the machine. Their position with spect to the main flux path determine

the welding current.

The unit is available in 200 amper 300 amperes, and 400 amperes, the 2 ampere unit being equipped with Chriler Industrial Power Unit Model T-the 300 ampere unit with Model T-and the 400 ampere unit with Model T-and the 400 ampere unit with Model T-the 300 ampere unit with Model T-the 500 ampere unit with Model T-and the 400 ampere unit with Model T-and the 400 ampere unit with Model T-and the 400 ampere unit with Model T-and the 500 ampere unit with Model T-and the 500 ampere unit with Model T-and the 500 ampered to 1 amper

BURN

OUT



Easily— Quickly— Without Injury To the Threads

The Walton Tap Extractor is a device for removing taps broken at or below the surface of the work — easily — quickly—and without injury to the threads.

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springs and running gear equipped with four 16x6.00 pneumatic low pressure rubber tired wheels. The rigid mountings and spring mountings can varied.

The machine is completely enclosed in a heavy frame which is said to make it practically indestructible. The electro-hydraulic idler is simple and positive in action and will allow the engine to run at full speed for any desired time up to several minutes after the welding stops, saving fuel, oil and engine wear.

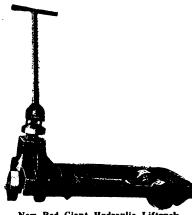
New Red Giant Hydraulic Liftruck

To handle weights greater than are ordinarily assigned to single and double stroke trucks, and to elevate more than $2\frac{1}{2}$ in., Revolvator Co., North Bergen, N. J., has brought out the new Red Giant Hydraulic Liftruck shown in the illustration. This truck is designed to lift loads of from 2500 to 10,000 lbs.and heavier if necessary.

The advantages claimed for this truck are made possible by the hydraulic system. The load may be elevated by long or short strokes at the will of the operator, the effort being equal from any angle around the circle.

An automatic shut off is provided to

operate when the platform reaches the full height. The load is released means of an automatic foot lever, which is adjustable. A telescoping frame



New Red Giant Hydraulic Liftruck

used which gives the maximum of clea ance underneath and provides the max mum of strength with the minimum



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A NEW high speed steel . . . a New PRECISION heat treatment . . MORE pleoss per grind . . MORE grinds procach 25% to 35% LONGER broach life . . . ABILITY to handle the new hard alloy steels. DURAKEEN BROACHES cut your coets. TRY THEM on your next broach order. New Builetin on request.



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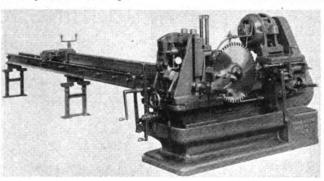
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weight. The hydraulic system is oiltight and leak-proof. The handle is spring balanced, the springs being enclosed in an oil chamber. A free pull on the handle is available at any height of the lift. The handle is positive but non-kicking, operating on roller bearing pivots. The large turntable makes for effortless steering, due to the ball and roller precision bearings.



Cochrane-Bly No. 55 Sawing Machine with Attachments

Attachments for Cochrane-Bly Sawing Machine

The Cochrane-Bly Company, Rochester, N. Y., has developed special handling apparatus for square and rectangular bars that will grip the bundle of bars on the end and feed them all the way up to the saw blade. As applied to their No. 55 Sawing Machine, here illustrated, the fixtures are designed to hold 40 cold drawn bars ½ x2-in. or 20 cold drawn bars ½ x2-in., which are supported on rolls and held in the extended carriage which will reach over the bed of saw up to the saw blade. The stock carriage is fed forward by chain and sprocket operated by a crank handle.

The vise is air operated through compound toggle link and is instantane ous in its movement, requiring less that five seconds to unclamp, feed stock to gauge, clamp and start feed of saw. Vis is provided with a lateral clamp to keep bars in perfect alignment. The fort bars are cut 2 in. long and to close tol erance in cutting time of one minut and fifteen seconds. The apparatus is

The apparatus is adaptable to the cutting of man other sizes and lengths of squar and rectangula bars.

"Chicago" Soft Rubber Polishing Wheels

A new type o

polishing wheel it which an extremely soft rubber bond having a high degree of ductility and flexibility is impregnated with of polishing comn as the "Chicago" or Wheel has been

impregnated with five different types of polishing compound, to be known as the "Chicago" Soft Rubber Polishing Wheel, has been placed on the market by Chicago Wheel & Manufacturing Co., 1101 W. Monroe St., Chicago, Ill. The wheel is intended for removing finish grind marks and is said to produce a high and brilliant finish on any metal surface.

The wheel can be run either wet or dry on practically any standard equipment and may be dressed with an ordinary diamond or grinding wheel dresser to any desired contour. Due to the type of bond used, the contour will be maintained over a long period of time without the necessity of further dressing.

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SINGLE AND DOUBLE

For use with automatic machines and punch presses with feeds. Also reels for wire.

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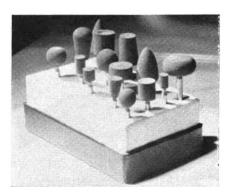
OPEN TYPE



THE TOMKINS-JOHNSON CO. 620 N. Mechanic St., Jackson, Michigan

There are screens to cloa. The drive shaft and impeller tube are one unit revolvina together. Coolant cannot come in contact with the **Ball Bearings which** are within 1 inch of impeller. the 9-76 Capacities G.P.M.

CLOSED TYPE



"Chicago" Soft Rubber Polishing Wheels

The cutting action of the wheel can be varied in keeping with the requirements of the job upon which it is used. The polishing action is always evident, however, regardless of the cutting action of the wheel, due to the fact that the bond itself is a burnishing agent and is in a large part responsible for the efficiency of the results. The high polish is obtained without chatter.

The wheel is ideally adapted for portable equipment of all types having speeds

that would give the wheel a sur speed not in excess of 4000 s.f.m. On the features of the wheel is that I speeds are not required for its app tion. Surface speeds lower than s.f.m. will give perfectly efficient res

s.f.m. will give perfectly efficient res A sample of the "Chicago" Soft F ber Polishing Wheel will be sent to reader of this magazine upon reque

Allis Chalmers "Ruptor" Equip

The Allis-Chalmers Manufactic Company, Condit Works, Boston, Mannounces a new type of across-the air motor-starter, equipped with "I tors", known as type AP-7. The "I tors" are enclosing chambers which fine and depotentiate the arc forms circuit interruption. These "Arc-I tentiating chambers" greatly ince the interrupting ability of the confunction of t

Other features include: vertical and break- silent operation; entemperature overload relays, affor positive motor protection; unit struction, pole units consisting of vidual molded bases mounted on a chassis, thus assuring true co



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Nos. 15-25-35

—a new design with renewable bearings that permits operation at usual motor speeds.

Nos. 53-55

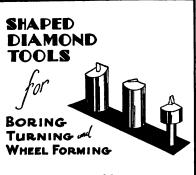
—a ball bearing pump giving large volumes at high pressures for supplying oil for hydraulic operation of machinery (illustrated.)



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alignment; large silver double br contacts—no contact dressing need contacts accessible and quickly rene able; pilot circut isolated from circuit, permitting a separate convoltage for push-button circuit wh necessary; motor starter unit arran-



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for flat surface mounting when appli without enclosure. The starter is funished for 7% h.p. at 440 and 550 vol 5 h.p. at 220 volts, and 3 h.p. at 1 volts.

Bremil All-Alloy Portable Hand Shear

The claim is made by Bremil Manufacturing Co., 1725 Pittsburgh, Average Price, Pa., manufacturers of the Brem All-Alloy Portable Hand Shear, that the mill type shear will cut, without spring the jaws, strip or sheet metal



Bremil All-Alloy Portable Hand Shear

any width or thickness, regardless of carbon content, that the operator has strength to cut. The shear parts are heat treated to obtain the closest possible physical properties. The shear has successfully been operated on hin. thick 40 carbon stock. The shear are equipped with removable cutting blades made from the finest grade alloy (shear blade) steel accurately machined, heat treated and surface ground to insure accuracy. The replacemen

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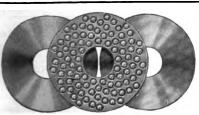
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feature makes it possible to replace worn out blades, thereby making the shear as good as new at a nominal cost.

The shear is made in two sizes. The smaller shear will cut up to No. 11 gauge sheet with ease and do it consistently without springing the jaws. This gives the shear a range well within the requirements of the average sheet metal worker. Its weight, 22 lbs. makes it an ideal portable tool. The construction is perfect for use as a bench shear.

Dumore Model H 1/50 H. P. Universal Motor

The Dumore Company, Racine, Wis., announces a 1/50 h.p. universal motor to be known as the Model H. Available in several different types such as ventilated, totally enclosed, sleeve and ball bearing, and with worm gear speed reduction units, this motor is said to embody the latest features of modern motor design. It is extremely compact, sturdy and efficient.

The standard Model H is rated at 1/50 h.p. at 6500 r.p.m. for thirty minute duty. The standard open motor known as the HV is rated at 1/50 h.p. at 5000 r.p.m. continuous duty, or 1/55 h.p. at 4000 r.p.m. for thirty minute

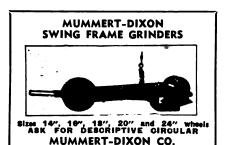


Dumore Model H 1/50 H. P. Universal Mot

duty. Complete engineering details an blue prints are available for those wire request them.

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A complete line of screw drivers and hand and power bits for use with Philips recessed head screws is now being made by Stanley Tools, New Brita:
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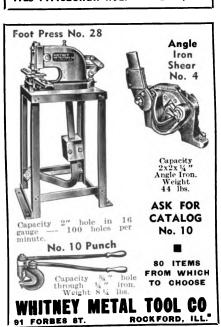
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many other assembled products, the mand is constantly increasing for to of this type. Stanley Screw Drivers made in four sizes, to drive the entrange of sizes of Phillips screws bolts.

Hand and power driven bits are ma



Stanley Screw Drivers for Phillips Screw and Bolts

for use with bit braces and with Yank drivers. Power bits to fit Stanley, Bla & Decker, Thor and other electric scr drivers are included in the line.

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Wrench manufacturers have long cor plained that users abuse wrenches putting pipe over handles to increa



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No. 5-26 BENCH LEGS— This leg is sturdily constructed and will make a rigid foundation for any bench requirement.



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This line comprises "straight", "off-set" and "angle" types with openings from 1½ in. to 3½ in. Long tubular extensions are provided that slip over the forged handle and permit leverages up to 30 to 1, and "striking sleeves" that are designed to protect handles when "loosening or setting nuts in close quarters with a hammer or sledge."

Hi-Eff Variable Speed Transmission

"Hi-Eff" Vari - Speed Control shown in the illustration is being introduced by the Columbia Vari-Speed



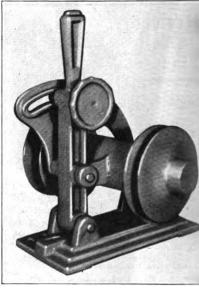
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Hi-Eff Variable Speed Transmission

Company, Wheaton, Ill. It incorpora the adjustable V-pulley principle in new single shaft design. The transm sion consists of a single shaft in whi are two adjustable V-belt pulleys, whi vary in diameter as their distances from the driving and driven pulleys s changed. It offers infinite speed sele tivity within ratios of 5 to 1, and tenshow it to be over 90 per cent efficient

The distinctive features of this tran mission are single shaft design, corpactness, efficiency, economy, only o place to lubricate, self-centering corpensatory pulleys, ease of installationary the use of standard V. buller, It. and the use of standard V-belts. It

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Semi Steel Body — Four Jaw Independent

1 1/4" nickel steel screws 11/4" width of jaws

3 1/2" width of body

Do not confuse these heavy duty Lathe 12"—4 Jaw Ind. Chucks with inferior grades. These low prices make these Chucks outstanding 14"—4 Jaw Ind. walnes. Write for catalog. 838.00

10"-4 Jaw Ind.

L-W CHUCK CO., 20 N. St. Clair St., Toledo, O.



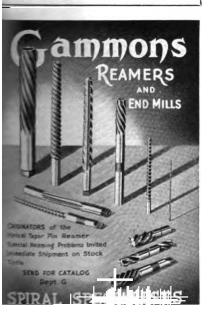
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SUTTON STYLE "L" Master Feed Finger

For Automatic and Hand Screw Machines



Interchangeable and Replaceable Pads

held securely in master without pins or screws



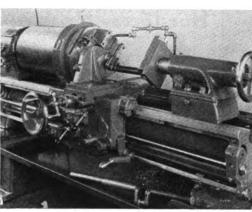
"ONLY SUTTON" Features. Special design of master eliminates jamming stock. Special design of pad permits hole size to be restored repeatedly before replacement is necessary. Master heattreated for tension only and pads for resisting wear only. Secure all of these advantages by specifying "Sutton Style L Only."

 Other Sutton Products: DIAMOND-GRIP Collets, single-piece, master, and compensating types; tubes, spools, and nuts; lathe and milling machine collets.

WRITE FOR COMPLETE CATALOG SUTTON TOOL COMPANY offered in sizes from $\frac{1}{4}$ to $7\frac{1}{2}$ horse-power.

Reed-Prentice 16-In. Lathe

The illustration shows a Reed-Prentice 16-In. Lathe with tooling for turning single throw crankshafts such as are used extensively in the manufacture of textile machinery. The lathe is built by



Reed-Prentice 16-In. Lathe

the Reed-Prentice Corporation, Worcester. Massachusetts.

The lathe will handle shafts from 14 to 3½-in. diameter, the maximum length that can be accommodated in a chuck being 27¾ in. Micrometer adjustment for the throw of the crank pin is provided both on the chuck and on the tailstock. The maximum throw is 4¼ in. and the minimum throw is 1¼ inches.

The lathe is equipped with a ball bearing tailstock spindle, micrometer stop on the bed for positioning the tool for starting, and an automatic stop for

the end of the cut. The lathe is of usual Reed-Prentice sturdy design.

Lincoln Electrode Designed Specifically for Fillet Welding

A new electrode which elimins necessity of multiple pass welding production of fillet and lap welds

many applications, and where production of statements production of statements production of statements produced by Lincoln Electric Compa Cleveland, Ohio. Fillet we up to % in size with one plass with the electron pass with the electron pass with the electron at the vertical plate a no overlap at the horizon plate.

Fillet welds of any size of be made more easily, of bet quality and at higher specified with the electrode than theretofore possible. The vantages will be apparent all applications for fillet weing including ship-buildibridge and building constrution, fabrication and manufacture.

The new electrode, designal as "Fleetweld 8", is the result of conserable research and experiment by L coln engineers to develop an electrowhich would simplify fillet welding a improve its quality and economy.

The new electrode is heavily coat for welding by the shielded arc process. The welds produced are smooth a dense with notably high physical presents. The tensile strength of the we metal as deposited is 68,000 to 72.0 lbs. per sq. in. Ductility is 20 per ce to 30 per cent elongation in 2 in. deposited, and 30 to 36 per cent strelleved. Other properties including

"EDGEMONT" *FERTIES FRICTION CLUTCHES EXPANDING "TYPE B"



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This and other outstanding features about which we shall send information make G-K Lathes ideal for the efficient shep. Write for catalog.

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SERVINE CASTER & TRUCK CO.

sistance to fatigue, impact and corrosion are equal to or better than mild steel.

"Fleetweld 8" comes in 14 and 18 in. lengths. The 14-in. lengths are made in $\frac{4}{3}$, 5/16, $\frac{1}{4}$, $\frac{3}{16}$ and $\frac{5}{32}$ -in. sizes while the 18-in. lengths come only in the $\frac{4}{3}$, $\frac{5}{16}$ and $\frac{1}{4}$ in. sizes. The electrode will be found of particular value by firms whose products require production of high quality fillet and lap welds at maximum speed and economy.

Superior Ventilated Storage Rack Superior Wire and Iron Products, 1055





E. 76th St., Chicago, have developed storage rack which is claimed to hav several distinct advantages.

Heavy wire mesh so woven to expos an absolute flush working surface fo stock handling ease, gives complete ven tilation, prevents warping or moistur accumulation, allows no dust or dir accumulation, allows maximum sprink

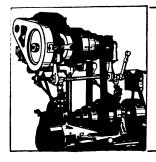


Superior Ventilated Storage Rack

ler system operation and permits the of light through complete structure for better working conditions Shelves are adjustable to any position without trouble, allowing complete flexibility of equipment for changing stock requirements and permits a more compact stock arrangement. Center post construction allows access to material from any direction without hindrance. But to fit any material handling requirements, Superior Ventilated Racks may be obtained in any size and are standard equipped for stationary, portable or mono-rail installation.

Sterling Box and Bin Rack

The rack Illustrated has been developed by the Sterling Factory Equipment



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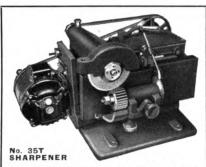
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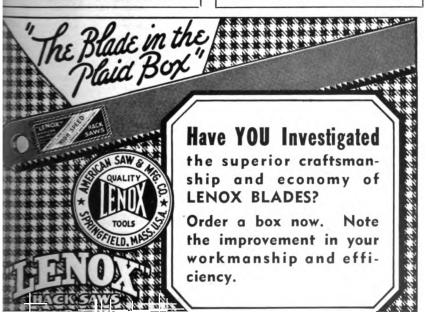
The saws are automatically indexed and sharpened within a variation of plus or minus .001 of exact diameter of entire lot.

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CLEVELAND, O.



Co., Inc., 189 Charles St., Providence, R. I. It can be furnished to fit any size of box and to go into any size space. The type of construction used makes the rack flexible enough so that it can be adapted to any box storage requirement. The rack is of all welded construction, which gives it rigidity. It is ready to use when received.

The Sterling rack utilizes full storage space. By avoiding the need for cross pieces under boxes, the space of two 5 in high boxes is saved in a 5 ft. high rack. Uprights are stocked in from under bench height up to 5 ft. Runners are stocked to fit boxes 12, 15, 18, 24

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Sterling Box and Bin Rack

and 30 in. long, but can be furnisifor other sizes. Connectors are m up to 5 ft. long. For heights over 5 racks are made to fit one on top of other. The box shown in the rack 10½ in. wide, 6 in. deep and 21 in. It This or other size boxes or bins of s are made to fit Sterling racks.

Numberal Wire Numbering Machine

A wire numbering machine compriessentially a power press with at matic number head has been brot out by Numberall Stamp & Tool Inc., Huguenot Park, Staten Island Y. The new unit has been development.



7 ½ in. Rotary Table for Small Miller Tables

Send for circular.

STEVENS ROTARY TABLE

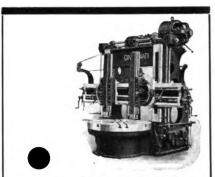
Table graduated for single degree readin Worm can be disengaged for turning tab by hand.

Other sizes 12", 18" and 24" diameters

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VERTICAL BORING MILLS
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Fig. 1249

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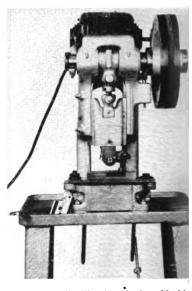
Commercial Centerless Grinding Co.

6538 Carnegie Ave., Cleveland



to mark test wires and is intended use by wire mills and screw manu turers.

The press is powered by a $\frac{1}{4}$ h.p.: or. It has an automatic number head which stamps consecutively 1 in. figures in a vertical position on wires. Three or four wheels are ge ally used at a time to stamp figures to 999 or 9999 respectively. A bol



Numberall Wire Numbering Machin

with V-blocks is designed to take from 1/16 to 1/2-in. diameter. The bering head can also be furnishe duplicate or triplicate the nun The feature of the tool is the extr high speed with which wires ca marked.

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Heretofore the best compressors gas boosters have been generally v cooled for continuous work, and th cooled ones were used for light or mittent service.

However, there are times when is not available, or is expensive t and for this service Lammert & Co., 221 N. Wood St., Chicago, Ill designed a new air-cooled gas book it is so efficiently air-cooled that when installed in places which are warm, they run cool, quiet, and w

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12"	SIZE	\$55.00
16"	SIZE	63.00
20"	SIZE	90.00

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MODEL 25 HI-DUTY MARKING MACHINE

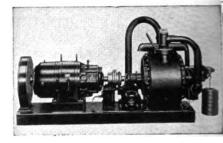
This machine operates from your plant air line, and is one of numerous models built to produce fast, neat marking on metal parts. Hi-Duty marking machines may be had for practically any marking operation, and we will be glad to make recommendations upon receipt of your inquiries. Send prints or samples of of your inquiries. Send prints or samples of parts to be marked, showing lettering and location, also state required production.

GEO. T. SCHMIDT, Inc. 1806 BELLE PLAINE AVE. CHICAGO, ILL.

vibration, making the use of water for cooling entirely unnecessary even for the heaviest work.

In gas boosters it is essential that the pressure be steady at high or light load, and this is accomplished to perfection by the Lammert compensator. This booster also cuts the power cost. When the discharge of the compressor is reduced, the motor is automatically unloaded proportionately. In other words, a saving is made by the method of controlling the pressure.

This Lammert booster requires no foundation and is ideally adapted for



Lammert Air-Cooled Gas Booster

portable use. It has forced-feed lubrication and is furnished with a separator that separates the oil from the gas very effectively.

Hamilton Portable Elevating Table

The Hamilton Portable Elevating Ta-ble shown in the illustration has been brought out by The Hamilton Tool Com pany, Hamilton, Ohio, to meet the need for a portable device, adjustable fo height, which can be used for trans porting dies, fixtures, or materials a an outboard support for extra long work or as a work table upon occasion.

The feature of the table is the facthat it can be adjusted for height with in a given range; thus a die can b moved directly from the work bench t the table without lifting, lowering, o using a crane.

The table is made in two styles, in dicated as "A" and "A-2". The dimen sion of the Style A table is 21x33 in The maximum height from the floo is 40 in. and the minimum height, 2 Weight, crated, 310 lbs. Carryin capacity, 2,000 lbs. The dimension of the Style A-2 table is 26x38 in. Maxi mum height from floor, 42 in. Min

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Type "I-A" from ½" to 3" bores. (Other types to 14".) Nontypes to ".) Non-low cost trouble-free

noiseless.

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mum height, 28 in. Weight, crated, 560 lbs. Carrying capacity, 5,000 pounds.

The elevating mechanism consists of four square-thread screws, operating in



Hamilton Portable Elevating Table

corresponding nuts which are supported in anti-friction thrust bearings. Power revolve the nuts is transmitted through gears operated from a shaft that is turned by means of a hand crank. The unit is mounted on antifriction swivel casters.

Easy-Flo Brazing Alloy

Handy & Harman, 82 Fulton St., New York., N. Y., has placed on the market a brazing alloy to be known as "Easy-Flo." Easy-Flo is said to be free flowing at 1175 deg. F., which is the maximum melting point yet developed for any brazing alloy or silver solder having a high degree of strength and ductilety. Easy-Flo is malleable and ductile and

Easy-Flo is malleable and ductile and can be rolled into sheets or drawn into wire of practically every dimension. is made in three standard sizes, 1/32in., 1/16-in. and 3/32-in. round wire. These sizes have been found convenient for use on most work. It can be used to advantage in place of silver solder. Strong joints, as strong or stronger than the metal joined, have been made with Easy-Flo on both ferrous and non-ferrous metals including iron, steel, sta less steel and iron, Monel metal, Inco. Everdur, copper, brass, bronze, nic copper-nickel alloys, chrome-nickel loys, and silver. Joints \are ductile

withstand shock and vibration.

Butt joints made with Easy-Flo h
a tensile strength of 40,000 to 120. lbs. per square inch depending upon metals joined. When the method metals joined. When the method heating is such that the work is su jected to a low temperature for a bright period of time only. Easy Flo with fast-working qualities offers a spec advantage in making joints on Mometal, nickel or nickel alloys, and stalless steels. It flows freely, prenetral deeply and rapidly, and tends to avoid the stall the s deeply and rapidly, and tends to avo the detrimental effects that high ier ter peratures have on the physical dualiti of these metals.

Under most conditions Easy-Flo : tho marked corrosion resisting prope ti Galvanic action set up by the me. ' joined is a more serious factor than th composition of the solder. Where severe conditions are encountered corrosion for example, chloride corrosion on joints made of stainless steel, the use of a modification of the standard Easy-Flo known as Easy-Flo No. 3 is recommend This alloy contains a small percent age of nickel and has a slightly higher melting point, that of 1270 deg. F.

In close fitting joints, very little Easy Flo is required. A film is said to give far better results than a fillet, and. du to the low melting point and less pre heating labor, time and gas are saved Due to the penetration, there is little o none of the alloy left on the outsid

of the joint.

Mall Tool Universal Grinder

The Mall Tool Company, 7740 S. Chi cago Ave., Chicago, Ill., has announce a 1½ h.p. flexible shaft grinder to b known as the "Universal" Grinder.

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Improve your assembly and cut your costs in half by replacing small taper pins, straight or cotter pins, keys and rivets with this new fastening pin.

Use straight drilled holes, no tapping or reaming. Diameters 1/32" to 1/8". Length up to 11/4".

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AMES hockless GAUGES

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bid you ever ruin a good fountain pen with poor ink? Well, if you've had that experience, you know just how I feel about die work.

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The Universal operates at 9,000 r.p.m. on either 110 volt A.C. and D.C. or 220 volt A.C. and D.C. currents. It is said to deliver high speeds together with high horsepower to the working tool. With the high speed Universal Grinder, a 4-in.



Mall Tool Universal Grinder

wheel will accomplish the same results as an ordinary 8-in. wheel, according to the manufacturer.

The Universal Grinder is recommended for surfacing and snagging castings, grinding stainless steel, and such other grinding jobs as found in most industrial plants.

Atlas High Pressure Reducing Valve

The Atlas Valve Company, 282 South Street, Newark, N. J., announces their improved Type "E" Forged Steel Body High-Pressure Reducing Valve for oil as well as water and air. A number of important improvements have been effected to make the valve truly modern in every

respect. The internal metal parts a entirely of stainless steel. A form packing of special material superior leather has been adopted which is in mune not only to water but to oil at other fluids commonly used in hydrau machinery.

The pressure on the seat is balance by a piston with the result that varitions in high initial pressure have liteffect on the reduced pressure. It recommended that where the reductiis from a high to an extremely lipressure it be performed in two stausing a lower pressure valve for tsecond stage.

Sherwin-Williams Air-Drying Sp Welding Black Primer X9185

An air-drying black primer develop primarily for automotive manufacture but which can be used to advantage other manufacturers of metal produc has been brought out by the Sherwi Williams Company, 101 Prospect Av N. W., Cleveland, Ohio. The shipping storing of partially fabricated parts h set up a problem in the past due to t difficulty of preventing the rusting lapped edges which were to be weld later. When surfaces that are to be sp welded are coated with ordinary pair enamel or varnish, the film tends insulate the metal surfaces with the r sult that when sufficient current is us to weld the painted spots, so much he is created that often the metal su rounding the painted area burns as results in a poor weld. When Air-Dryi Spot Welding Black Primer X9815 used, spot welds can be made insta taneously with low voltage and lo pressure. Also, the burning away paint around the spot weld is elim nated.

The black primer dries in 10 to minutes and can be handled for sp welding in 25 to 30 minutes. It pr

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MANDRELS

They act as internal chucks for holding work while being machined on lathes, millers, grinders or shapers. Made in 14 different sizes, taking bores of every fractional part of an inch from ½" to 7". Sold either singly or in sets. Builetin 530.

either singly or in sets. Bulletin 830.

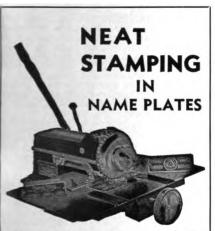
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ALES OFFICES: A MAKER

vents rust forming between the laps, which are the places where moisture accumulates and causes the most damage to unprotected steel.

Ideal Washer Punch

The illustration shows a washer punch which is now being made by Ideal Commutator Dresser Company, 1445 Park



ldeal Washer Punch

Ave., Sycamore, Ill. The punch is intended for use in cutting washers from metal, fabric, gasket material, fibre,

steam packing, straw board, asbest leather, felt, cork, rubber, and out materials up to 1/16 in. in thickne With the 18 hardened dies which furnished with the machine, it is p sible to obtain 150 different sizes washers.

The dies are mounted in an eccenturret plate in which they are local as close as possible to the edge, proving the utmost convenience in center and withdrawing the washers from machine. The centering system used sures concentric punching.

Norton-Pike Oilstones in Distinctive Packages

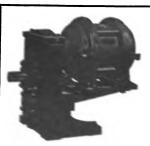
Norton-Pike Oilstones and Abra Specialties, now being distributed Behr-Manning Corporation, Troy, N. division of Norton Company, are being packed in packages of indivicolors to aid in the selection of the rect abrasives. For example, India stones packages are labeled in barkansas green, Lily White Washita and Crystolon products such as the stones, round edge slips, axe stones. Head Utility Flies and others such a combination of bright red and green combination combined to the combined combined to the combin

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painful and may become serious.

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J., developed two special prote



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E. A. Baumbach Mfg. Co.

1806 S. Kilbourne Ave., Chicago, III.

creams, one for use on the hands before beginning work and the other for use after the work is finished. The excellent results obtained by the use of these creams have led this company to place these preparations on the market. The cream to be applied before beginning work is known as Protective Cream No. 1, and the cream to be applied after finishing work is to be known as Protective Cream No. 2. They should be used together. Workers in paints, chemicals, grease, or oils, and painters, machinists, and other mechanics will find that the use of these creams prevents the skin from drying out, cracking, and developing fissures and sores.

Clark Tote Pan Truck

A self-loading and unloading tote pan truck of tubular steel, electric welded construction has been placed on the market by All Steel Welded Truck Corporation, 1123 Railroad Ave., Rockford, Ill. The truck is equipped with two vertical straps and has a capacity of 1000 lbs. The extended arms which fit under the tote pan flanges enable operators to pick up pans singly or nested.

Standard equipment includes two sixin. diameter semi-steel or Goodrich rub-



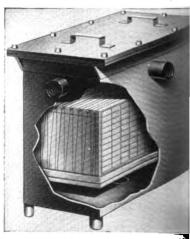




Clark Tote Pan Truck

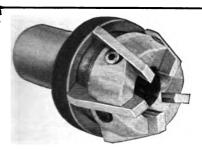
ber wheels, fitted with Hyatt-type n bearings. The truck is available for standard sizes of tote pans.

Mahon Renewable Strainers
To solve many of the problems
perienced in connection with Hydro



Mahon Rectangular Type Renewable

spray booths and industrial wa machines where recirculated wate



GENESEE ADJUSTABLE HOLLOW MILLS

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Have Genesoe cut your costs. We design and manufacture hundreds of special and multiple operation production tools. Send samples or blueprints now.

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Take fullest advantage of precision machines, with

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Size

Roundness Taper

Bell mouth Barrel shape

You need this measuring gage for checking the work of modern machine tools. Puts precision inspection on a production basis. Assures ACCURATE holes.

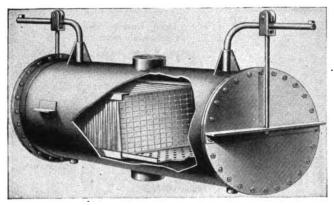
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THE COMTOR CO.

Waltham, Mass.

Est. 1927





Mahon Cylindrical Type Renewable Strainer

quires an efficient strainer with a minimum resistance to flow, R. C. Mahon Company, 8650 Mt. Elliott Ave., Detroit, Mich., has placed on the market a rectangular type and a cylindrical type strainer. The capacities range from 60 g.p.m. to 840 g.p.m.—rated capacities providing 1 sq. ft. of filter area for each 5 g.p.m. handled.

The filter packs of the renewable

MAGNETIC CHUCKS

Highest Quality.
All Sizes—For All
Types of Work. A
Complete Line Of
Rotary, Rectangular
and Swiveling Magnetic Chucks.

35 Years Experience Write for catalog and price list No. 11

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GENERAL UTILITY PRECISION \$19.75
FLEXIBLE SHAFT MACHINE...

Quantity Production makes this price possible!
Powerful air-cooled Universal motor.
All metal Sheath—New Style Pencil
Type Handpiece Chuck. Wt. 2 czs.
Easily reaches unhandy places. Six speed foot rheostat. Total Wt. 4 lbs.
Fully Guarant'd. 10-Day Money Back Trial.
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LINIOK, GREEN
A REED, INC.
29 E. Madison St.
Chicago, III.

strainers are easi removed and r loaded.

JA-30 "Iackhammex"

A new drill 1 multitude jobs is the "JA-3 Jackhammer'', r cently introduce by Ingersoll-Ran Co., 11 Broad wa New York, N. It is already 1 wide use in place of heavier dril for light roc drilling, such a blockholding, trim

ming, scaling, holes for conduits, pipe foundation bolts, maintenance and demolition work.

It is stated that the new Jackhamme is a very fast driller and uses but



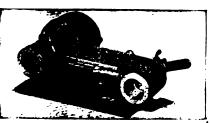
Ingersoll-Rand JA-30 Jackhammer

small amount of air.

The Jackhammer is of the usual sturdy Ingersoll-Rand type of construction, designed to achieve the proper balance in operation.

Balance in operation.

Bulletin No. 2254 shows the JA-30
"Jackhammer" and gives a number of
views of the drill in operation on representative jobs. A copy may be had
by addressing Ingersoll-Rand Company
as above.



An Inexpensive **ABRASIVE** BAND GRINDER

"Built Like a Machine Tool"

The Hormel-M Grinder is sturdily built with a supporting leg under the grinding table to eliminate vibration and tipping due to pressure on the belt. Ball bearing throughout. Equipped with ALEMITE LUBRICATION, complete with grease gun.

Write for illustrated folder on this and other styles and sizes.

HORMEL-M GRINDER WALLS SALES CORP.

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tions will give you flexibility in your stock-room to permit changes in size and shape to meet all needs. Made in five sizes, these interlocking of two six bins nest into one another to make a temporary or permanent stockroom of any size, wherever you want it. STACKBIN tions are made of

The full hopper front makes securely welded. it easy to see and reach the contents at all times. Turned edges prevent injury.

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SPECIALIZED INDUSTRIAL CLEANING MATERIALS & METHODS

Bristol Portable Pyrometer

A millivoltmeter-type Portable Indicating Pyrometer is now being offered by The Bristol Company, Waterbury, Conn. for measuring temperatures up to 3000



Bristol Portable Pyrometer

deg. F., using a thermocouple and extension leads.

Use of a cobalt magnet allows exceptional design features, including increased sensitivity and a widened scale for more accurate readings. Unusual sensitivity is accomplished without the need for critical leveling adjustments and with no sacrifice of ruggedness. The high-resistance millivoltmeter movement is double-pivoted and completely shield-

ed to prevent the effects of stray field. The molded Bakelite case is of moture and dust-proof construction, a of modern design. The instrument available in single and in double rang It is especially adapted for industruse.

Speed Case X-1515, Speed Tree X-1535 and Speed Treat X-1545 Steels

Since the introduction of "Speed Ca Steel more than two years ago, manufacturers—Monarch Steel Compa Indianapolis, Ind.—have constantly proved this steel, working always tow the end of obtaining higher phys properties and, at the same time, sacrificing anything in free machin In the belief that a steel of the type could be produced in the l carbon ranges, this company has bro out "Speed Treat X-1535", 30 to carbon, which, like "Speed Case", is open hearth steel using the same ex sive Speed Case process. X-1535 velops considerably more strength du the high carbon, yet it machines p tically as fast as Speed Case and is most as ductile. This steel has a te strength of approximately 895,000 yet it will machine at over 150 sui feet per minute, or carrying a mac ability rating of 100 per cent; it very good tool life and it is du enough to bend flat on itself in drawn without fracturing.

The third and most recent brought out is the "Speed Treat X-1 which is 40 to 50 carbon, open he steel, having a tensile strength of 11 lbs., and, like the other two steels, a class by itself as far as free mach is concerned.

X-1545 approaches SAE 1112 Bess in free machining, as it carries a r of 90 per cent. If this is compan SAE 1045, which carries a rating

THE KOCH TEST INDICATO

Scientifically designed to give extreme sensitiveness combined with ruggedness. The soft, smooth action of the Koch Test Indicator added to its high magnifying power makes it the choice of master toolmakers, machinists and inspectors. Two live ends inside and outside to .001". Write for illustrated builtuith and prices.



The only indicator with two live ends.

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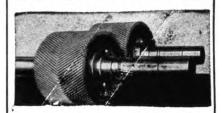
ancing, aightening trueing. They are made in the following sizes:

Swing	Greatest Distance Between Standards	Capacity in lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000



Made Anderson Bros. Mfg.Co.
by Kishwaukee St., Rockford, Ill.

FARREL-SYKES The Gear With



Noted for their accuracy, durability, high efficiency and smooth, silent operation, Farrel-Sykes continuous tooth, herringbone gears will enhance the value of any machine in which they are used. Available in a complete range of sizes:

¼ in. to 22 ft. dia.
 ¼ in. to 60 in. face
 24 to ½ D. P.

FARREL-BIRMINGHAM COMPANY, INC.

381 Vulcan Street, Buffalo, N. Y.



Portable Tools of Top Performance

Pneumatic Portable Tools—by BUCKEYE! That's the answer to the portable production tool problem in thousands of plants the industrial world over. Top-performance, plus economy and endurance have won top honors for them... The No. 360 Pneumatic Grinder is an outstanding tool of an outstanding line.

A complete line of Grinders—Sanders—Polishers—Drills—Screwdrivers—Nut Runners in both Pneumatic Portable and High Frequency Electric (186 cycle) Types.

THE BUCKEYE PORTABLE TOOL CO. THERE

per cent, and it is kept in mind that Speed Treat X-1545 is from 5000 to 10,-000 lbs. stronger in tensile strength, it will be seen that tremendous savings can be made in machining, which will offset many times the slight increase in the cost of X-1545.

The manufacturer states that Speed Case will machine faster than SAE 1112 Bessemer, X-1535 at the same speed, and X-1545 only slightly lower. This means that due to the varied and unusual physical properties, these three steels can replace to good advantage practically all of the SAE non-alloy steels under .50 carbon. It is merely a question of choosing the steel of the proper tensile strength, as it is no longer necessary to slow up production merely because the steel required happens to be in the high carbon range.

The two Speed Treat steels, X-1535 and X-1545, lend themselves readily to heat treatment, so that excellent physical properties can be developed in the heat treated state, yet at the same time the user has the advantage of machinability far in excess of what was formerly obtained from steels of the same

carbon content.

Carboloy Film Shows Rapid Grinding Method

Supplementing their grinding demonstrations of 1936, Carboloy Company, 2975 E. Jefferson Ave., Detroit, Mich., recently released a sound slide film showing their new, rapid technique for grinding Carboloy tools. The 124 pictures in the film dramatically present the correct and incorrect methods of grinding Carboloy tools and the proper equipment for correct grinding. Not only does this film describe technical details of interest to tool grinding operators but also, due to the broad benefits and economies which are clearly shown, it is of especial interest to production and

administrative executives as well.

After the completion of its west schedule of showings, the Carbo Company will make the film available.



to Engineering Societies, Foremet Clubs, Purchasing Agents' Association as well as additional plants interest in obtaining the benefits of this reprint grinding technique. Requests this sound slide film may be address



THE M-B

"Super" Speed Air Grinder An Outstanding Performer The ONLY Hand Grinder with Spindle Speed of 100,000 R.P.M. Operates on Air Pressuree of 45-100 pounds. Weighs 8 ½ ounces.

Combined Automatic Lubricator and Air Line Filter

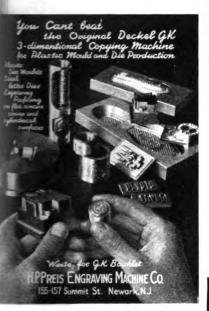
Delivers Absolutely Clean, Lubricated Air to Bearings of Any Tools, Operated Off Air Lines. Eliminates Oostly Shut Downs.

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M-B PRODUCTS

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Danly All-Steel Sets
Danly Commercial Sets
Danly Die Makers' Supplies

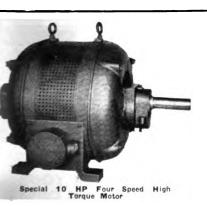
DANLY SERVICE

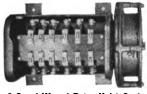
8 Danly Warehouses Provide 24-Hour Service for 85% of All Metal Fabricating Plants

DANLY MACHINE SPECIALTIES, INC.

2122 South 52nd Avenue, Chicago, III. 513 East Buffalo Street, Milwaukee, Wise Long Island City, N. Y., 36-12 34th Street Dayton, Ohio, 990 E. Monument Avenue Detroit, Michigan, 1549 Tcmple Avenue Rochester, N. Y., 16 Commercial Street Cleveland, Ohio, 1745 Rockwell Avenue Philadelphia, Pa., 3913 North Broad Street

DANLY DIE MAKERS'





6 Speed Wound Rotor Hoist Control with Rope Wheel Operation

SPECIAL DESIGNS

*CLEVELAND" offers unusual service in meeting special requirements with prompt deliveries.

5 years experience has developed an organization that moves fast on rush orders.

TRY US!

THE CLEVELAND ELECTRIC MOTOR CO.

5213 Chester Ave.

Cleveland, Ohio

to Carboloy Company, Inc., 2975 East Jefferson Avenue, Detroit, Michigan.

Strand Type MY-4 Flexible Shaft Machine

The line of flexible shaft equipment manufactured by N. A. Strand & Co..



Strand Type MY-4 Flexible Shaft Machine

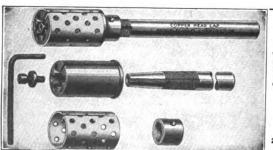
5001 N. Wolcott Ave., Chicago, Ill., has been augmented by the addition of the Type MY-4 Flexible Shaft Machine shown in the illustration. The machine is powered by a ½ h.p. capacity motor and has a three-speed ball bearing countershaft. The belt is guarded. The motor is mounted in a swiveling yoke, permitting the machine to swivel in all directions. Two combinations of speeds

are available; 1700, 3000 and 5200 rg and one with high speeds of 3400, t and 10,400 r.p.m.

The machine is equipped with a flexible shaft with a ball bearing h piece fitted with a split collet. The box is attached to the bench st which is provided with an adjust of raising or lowering the mach to the desired height. The manuturer has designed a small ball bearight angle attachment, interchange with this machine as illustrated is with, arranged with split collet for bing tools with round shanks.

Blackmer Rotary Hand Pumps. of hand pumps for the pumping liquids from one room to another from one story level to another, or pumping oils or cutting compounds tanks will be interested in a fourfolder which is now being issued Blackmer Pump Company, 1810 Cer Ave., Grand Rapids, Mich. This i describes the Blackmer pump with "bucket" design. This pump is salbe easy turning, to provide a conous flow and to have a 20-ft. sulfit. lift. The pump can be supplied pump only, or with a wall bracket, a spout, bung and suction pipe, or bung, suction pipe, discharge elbow, hose and nozzle. The pun supplied in five different types, Series 404 with a capacity of 10 gal minute; Series 405 with capacity gal. per minute; Series 605 with cap of 25 gal. per minute; Series 800 capacity of which depends on the terial being pumped, and the Serie which has a capacity of 20 gal. per ute. Copy of the folder free upo quest.

Easy-Flo Brazing Alloy. A brazing loy which is fast flowing at 1175 F. is discussed in this four-page



LOWER YOUR

With Copper Head Expansion Profitably used in hundreds of ing shops. Available in sizes V_n " to $2V_2$ ", graduated by sixt of an inch.

Many other designs for applications.

Write for Bulletin

BOYAR-SCHULTZ CORPORATION

CORPORATION 2120 Walnut Street, Chicago ow being issued by Handy & Harman, Pulton St., New York, N. Y. Copy ee upon request.

Dossier A-1, Mr. Balduck Solves a Hot be. This bulletin, purporting to be a sport of "A. Balduck" on the failure a conveying system in a manufacuring plant and the recommendations or eliminating the difficulties, is pub-ished by Baldwin-Duckworth Chain exporation, Springfield, Mass. Copy free mon request.

Fan Cooled Squirrel Cage Motors. A sublication describing the new line of Type CS Squirrel-Cage Motors has reently been announced by the Westingnouse Electric and Manufacturing Comany, East Pittsburgh, Pa. These moors employ a new heat exchanger priniple of cooling, self-cleaning ball bearngs, tested insulation with taped end urns and corrosion resisting construcion for general use indoor or outdoor where foreign matter would be harmful Copies of the publithe windings. ation are available from the nearest listrict office or direct from Department -N, Westinghouse Electric and Manufacturing Company.





STOP spollage. Get exact temperature of work in fur-Direct reading; calculations; no mainexpense. Strictly automatic.

Special bulletins on request. THE PYROMETER INSTRUMENT CO. 101-105 Lafayette St. New York New York

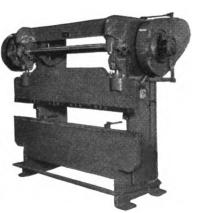


Capacity to Bend 96" of 10 Gauge

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ALLSTEEL JR. PRESS BRAKES

LEADTHEFIELD



Investigate These Cost Reducers Now

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gitized by GOOGLE

Clark Lift-Jack Units. The modern method of loading, handling and storing materials on skids and the manner in which these skids can be handled by the use of Clark Lift-Jacks is discussed in a six-page folder now being issued by All Steel Welded Truck Corporation, 1123 Railroad Ave., Rockford, Ill. Copy free upon request.

Cameron Motorpumps. Ingersoll-Rand Company, 11 Broadway, New York, N. Y., has issued a new catalog describing its Cameron Motorpumps. These pumps are compact machines combining elec-

STANDARD VERTICAL ANGLE PLATE GRINDER For Planer, Boring Mill, etc., 2 H. P. to 10 H. P.

Tool Post and Angle Plate Grinders for Lathes, etc. Write for complete catashowing Electric Drills, Heavy Duty Grind-ers, Disc Grinders, Buff-ing and Polishing Lathes. THE STANDARD

ELECTRICAL TOOL CO. 8th & Evans Sts. Cincinnati, Ohio



Regular Duty End-Wood Bearing.

Re-Wheel Your Trucks Save Your Floors Do the job right with Metzgar End-Wood Wheels. Easy-Rolling.
Long-Wearing.
Wheels for all trucks.
Casters for all purposes.

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tric motor and centrifugal pumps in single unit. Capacities range from 5 1000 gallons per min. for heads to ft. Motor sizes range from 1/4 to 40 l Copy free upon request.

Pulleys and Flexible Couplings. complete list of the Congress line of grooved pulleys, variable speed pulle step-cone pulleys, and flexible coupling made by The Congress Tool & Die Co pany, Inc., 9030 Lumpkin Ave., Detro Mich., is now available. Copy free up request.

Carpenter Service Bulletin, Volume No. 1. This issue of the Carpenter Sovice Bulletin, entitled "Tools; Their F lation to Plant, Men and Machines" now available and can be had by a dressing the Carpenter Steel Compar Reading, Pa. In this issue the edit of the bulletin discusses the present a anticipated skilled labor problem at the relation of proper tools to that pro lem. Copy free upon request.

Sebastian Lathe Catalog No. 37. this catalog The Sebastian Lathe Conpany, Cincinnati, Ohio, has endeavor to show in picture form, with as litt descriptive matter as possible, the se eral lines of Gold Seal Timken Equi ped, Viking Geared Head and Sebastis Cone Head Lathes, made in 10, 12, 1 14, 15, 16, 18, and 20-in. swing. Tr 14. 15. 16, 18, and 20-in. swing. Treatalog takes up each type of lather turn and by means of photographs and drawings presents each detail of the state of the s mechanisms involved in the design the different types of machines. A special rubber roll grinding lathe is in cluded and the catalog closes with pho tographs and descriptions of the extr attachments that are available for us on these lathes. Copy free upon re quest.

STURDIMATIC LIVE CENTER for LATHES, GRINDERS and MILLING MACHINES



It turns with the work. Eliminates friction of dead center.

Lowest possible overhang prevents vibration and chatter.

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e is opened reding the inner echanism. A

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Inside

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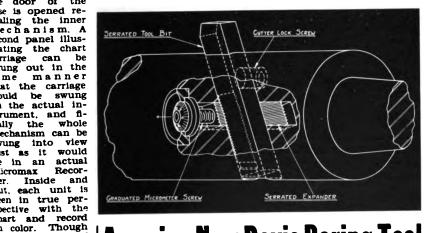
æds & Northrup Silver Anniversary A novel piece of romax Recorder. rature devoted to the Silver Anni-sary Micromax Recorder which is it by Leeds & Northrup, 4934 Stenton Philadelphia, Pa., is now being isd by this firm. In order to more ctively demonstrate the features of Micromax Recorder, the piece is de to the actual shape of the recorder is put together in such manner that effect is very similar to that that uld be achieved by placing a half-size del of the recorder in the hands of user or prospect.

the

The front of the piece, representing

ple-point recorders and on recording controllers are concisely described. back cover illustrates samples of various types of chart records. By asking for "Die-Out ND (1)", any mechanical executive can obtain one of these unique demonstrators.

Flow Meter Catalog. A new 40-page catalog on Bristol's Electrical and Mechanical Flow Meters is available for distribution by The Bristol Company, Waterbury, Conn. These instruments are for recording integrating, controlling, and indicating the flow of steam, liquids or gases.



Amazing New Davis Boring Tool

ACCURACY: Tool is precision built, assuring extremely accurate results.

INTERCHANGEABILITY: Uniformity of design and structure allow a rapid and accurate change of set-up.

RUGGED CONSTRUCTION: Permits with safety, increased speeds and feeds.

ECONOMICAL: Tools are universal in application, one tool covering a wide range of bores. Furnished in sizes for boring diameters 11/8" and larger. Extremely effective with T. C. tipped cutters.

MICROMETER ADJUSTMENT: Minute adjustment permits as fine as .0005" adjustment on diameter.

DAVIS BORING TOOL CO., INC., ST. LOUIS, MO.

ell the automatic ndicating and reording of any of wide variety of rocess conditions -not only temerature. but concenhemical ration. pН. per ent CO. smoke iensity, liquid evel, speed, freuency, load, voltage and so on. And though a single-point recorder is shown, the additional units re-

quired on multi-

Havnes Stellite Burnishing Rollers. This four-page folder, issued by Haynes Stellite Company, Kokomo, Ind., describes and illustrates the Haynes Stellite Burnishing Roller. According to the Haynes Stellite Burnishing Rollers are standard in many of the leading American railroad shops for burnishing locomotive driving axle journals, car axle journals, locomotive piston rods, crank pins and other parts. The par-ticular features which make Haynes Stellite advantageous for the manufacturer of rolling tools consist in the fact that Stellite takes a very high polish,

A Distinctive Value!



A Real Beauty, you will say when you see it. But Gerstner Chests are also built to serve you many years in protecting good tools from loss and damage. Select yours at your dealer's or from deal

dealer's, or from Free catalog if he does not carry them.

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We have been in the job stamping business for over 20 years, and have a well equipped plant with 30 presses ranging from small size up to 30 ton ram pressure.

We are equipped to make our own dies in our modern die shop.

Send sample or blueprints for estimate to Dept. 1.

WUEST BROS.

930-936 W. Hill Street, Louisville, Ky.

burnishes effectively, has a very low efficient of friction and that steel not adhere to it. The Haynes Stal Burnishing Roller revolves on double posed roller bearings protected by m dust plates. Copy of the bulletin upon request.

Baldwin-Duckworth Non-Corrosive Heat Resistant Chains Bulletin No. The machine finished power transs sion chains and roller chains made Baldwin-Duckworth Chain Corporat Springfield, Mass., are described and lustrated in an eight-page folder wis now being distributeed by that fi The bulletin includes a table show the resistance of the stainless steel t in these chains to various types of roding agents. Specifications and prare included. Copy free upon requ

Fairbanks-Morse Bulletin No. 1 This bulletin, issued by Fairbanks, M & Co., 900 S. Wabash Ave., Chicago, describes that company's line of p phase wound-rotor or slip-ring, b bearing, induction motors.

The high starting torque and starting current characteristics of the wound-rotor motors make them ide suited to applications where the rively high starting current of squared cage motors would be objectionable driving high-inertia, slow-starting to or where the size of motor required relatively large with respect to the possipply.

Slip-ring or wound-rotor motors be operated at either constant or related varying speeds, a feature that q ifies them for certain types of ser for which squirrel cage induction tors are not suited. With proper relating control, the speed can be vabetween half and normal with load (nected. Copy free upon request.



Cincinnati High Speed Universal Milli-Attachment. This bulletin, now belisted by The Cincinnati Milling chine Company, Cincinnati, Ohlo, ilfrates and describes the high speed diversal milling attachment which has en placed on the market by this firm. The on a variety of jobs, illustrating the matility of the tool and the simpliger of operation. Copy free upon relest. Ask for Bulletin M-748.

Exmitton Mill Cut Rotary Files are extrated and described in a folder

stributed by The milton Tool Co., North B Street, milton, Ohlo. The der shows the levent types and signs of mill cut ary files and deplicates of the differickinds of files. In the company of the differickinds of files are made 22 standard spes, numbered m 51 to 72. Each upe is obtainable five standard see Copy of folder cupon request.

teliance Discuke Motor Bulin 305. This bulin, comprising a se leaf page for ertion into a catg. presents the tures of Reliance sc-Brake Motors. e motor is illusted by means of otographs and a bowing the with double lining. The ed design in the bul-the hous-rigtion ele-ter indica-ter manual re-adjustments, ratings, inition and maince. Copy free on request.

Modern Cornell Doors Upward Acting. Cornell Iron Works, Inc., 38th Ave. & 13th St., Long Island City, N. Y., has just published a twelve page general catalog under the above title. Cornell has been making upward acting doors and grilles since 1828. The catalog describes and illustrates with details and photographs the Cornell Upward Acting Doors and Grilles. Illustrated are rolling doors and rolling grilles in various metals, and wood and steel Float-Over. Canopy, Bifold, Vertical Lift and Turn Over Doors. Actual installations are featured and unusual applications are shown. A copy is free for the asking.



Brown CO₂ Meter Catalog No. 3005. The Brown Instrument Company, Wayne & Roberts Aves., Philadelphia, Pa., has published a new catalog—No. 3005—on Brown CO. Meters. The new catalog covers the complete line of Brown Indicating and Recording CO, Meters as well as the combined CO, and Flue Gas Temperature Recorders. A schematic diagram on pages 12 and 13 illustrates the operating principle of the Brown CO, Meter and describes the passage of the flue gas through the various units. Copy of the catalog available to mechanical executives upon request.



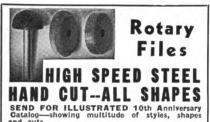
TRUMORE DIAMOND TOOLS

(PATENTED)

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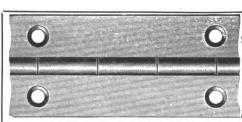


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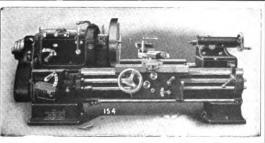
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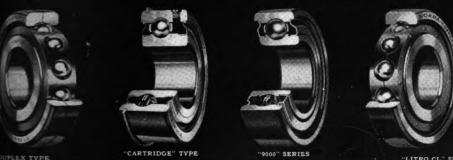
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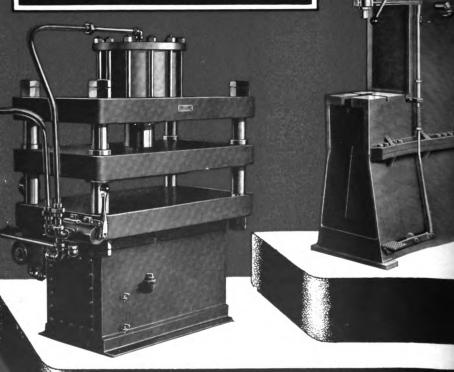
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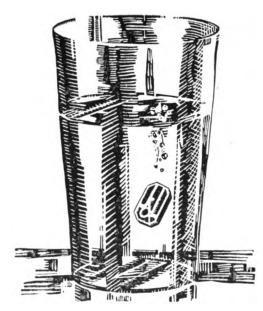
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July, 1937

Vol. 10, No. 2

Method of Stocking and Reworking Tool Steel on Norfolk & Western Railroad Avoids Waste

By Howard Campbell

THE methods of stocking and reworking high speed tool steel on the Norfolk & Western Railway System have been reduced to a system that has proved both efficient and economical. While fourteen sizes of flat high speed steel bars, ranging in dimensions from ½x1 in. to 1½x3 in. are carried in stock, the greater part of the steel is procured in the 1½x3-in. size.

The steel is made up into tools of this size for the wheel lathes, heavy planers, large boring mills, and other heavy machine tools, and the tools are distributed to the various shops of the System upon requisition. As the tools wear down to a point where they are too short for further use, they are laid aside and periodically are gathered up and returned to the Roanoke Shops, where they are reforged to smaller sizes. They are then redistributed and the process is repeated.

A stub of a large tool will make a complete tool of a smaller size; thus as the tools wear down, they are re-



View showing part of the equipment in the heat treat department at the Roanoke Shops of the Norfolk & Western Railway.



View of the opposite end of the department, showing Hevi-Duty electric furnace.

forged and reused until there is nothing left but a stub of %-in. square toolbit, which is the smallest size in use.

The size to which the stub is reforged depends, of course, upon the length of the stub. The sizes in use, however, and to which the tools are reforged when possible, are—in addition to the 1½x3-in. size in which the new steel comes—1x2 in., %x1½ in., %x1 in., % in. square, and % in. square. The latter sizes are, of course, used in Armstrong and similar types of toolholders.

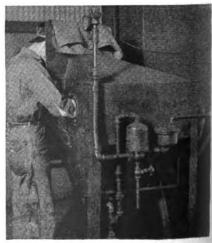
It is evident that most of the steel is reworked several times in the process of reducing it from 1½x3 in. to ½ in. square, and the question naturally arises as to what effect this reworking has on the quality of the steel. The answer is that as long as it is reworked properly and with a proper understanding of the temperatures at which such reworking can be done, the reworking has the effect of refining the grain of the steel and improving its quality. Under normal

conditions from 400 to 500 tools per month are reworked in this manner.

Considering that all of the forging, hardening, and tempering for the entire system is concentrated at Roanoke Shops, it is natural to expect that the heat treating equipment would be of the most modern type-and such is the case. The heat treat department is located on the balcony, away from the heavy machine operations on the main floor and at point where the sensitive pyrometers and other instruments will be unaffected by surrounding activities.

The equipment includes one 6-burner gas furnace, two Westinghouse electric furnaces (one 13x28 and one 13x22 in.), one C. I. Hayes 10x14-in. lo-Bar furnace, one

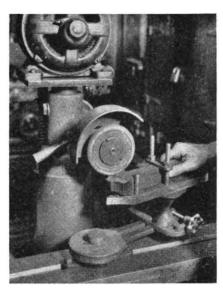
Hayes 10x14-in. lo-Bar furnace, one Hevi-Duty 18x36-in. electric furnace, one quenching bath (oil), and two gasburning drawpots that were designed by N & W engineers and built in the



All tools are sandblasted after hardening, both as a cleaning operation and to disclose any cracks that may exist in the tools.

Roanoke shops. The gas and Westinghouse electric furnaces are controlled by Brown pyrometers, the Hayes furnace is governed by a Leeds-Northrup instrument, and the Hevi-Duty Electric furnace is equipped with a Brown potentiometer.

After the high speed steel tools have been forged in the smith shop to the required sizes, they are delivered to the heat treating department on the balcony floor. As many of them as can conveniently be handled are placed in one of the Westinghouse furnaces, where they are preheated for a period of approximately one hour, bringing them up to a temperature of about 1,000 degrees. They are then advanced to the second Westinghouse furnace, where they are further heated to a temperature of 1600 degrees. The next move is to the Haves Glo-Bar furnace, where they prought up to 2300 degrees. This is he maximum; at this point they are menched in the oil bath to approxinately 600 degrees and then are noved to the Westinghouse furnace



One of the special fixtures used for tool sharpening. This fixture can be adjusted to provide any radius desired. In the case shown a relief is being ground just back of the cutting edge of a double radius tool.

again, where the temperature is run up to 1050 degrees. They are held at



General view of tool grinding department.



Here is a cutter grinding machine into which an extension has been built so that cutters can be ground without removing them from their arbors. The idea has paid for itself many times over.

this temperature from one to five hours, depending on the job and the size of the tool, to relieve the strains set up in the quenching operation. The tools are now ready for sand blasting and grinding.

All tools are sand blasted before they are sharpened, the sand blast serving the double purpose of cleaning the tools and disclosing anv defects. If a tool has been cracked in the hardening process, the crack will show up immediately upon sand blasting and the tool can be discarded before any more work is done on it.

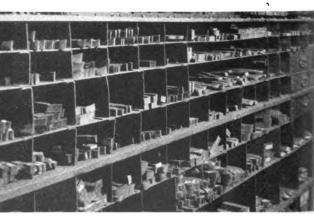
All tool grinding is done by men who, by special training and experience, have become experts at this work. The tool grinding department, which is located adjacent to the heat

treat department, is equipped with a wide variety of too grinding and sharpening equipment, and every kind of tool from a toolbit to a large inserted-tooth cutter for a planer-type milling machine is ground on a machine especially designed for the purpose.

The tools are handled in lots of convenient size, for purposes of economy, and as soon as a lot of tools is completed enough are selected to fill any requisitions that may be waiting and the rest are stored for further orders Steel bins are provided in which the tools are stored

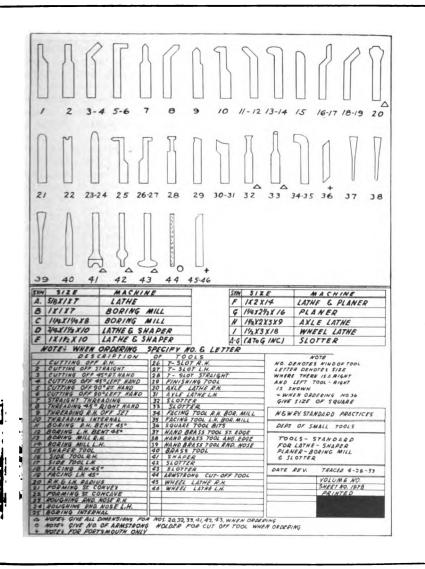
according to type and size; thus are order for new tools can be filled immediately.

To expedite the ordering of tools, a standard practice sheet has been made up, copies of which are in the hands



One of the storage bins for finlshed tools.

of the master mechanic or superintendent at each shop on the System. The sheet shows the shapes of 46 different kinds of tools, each of which is identified by a number. Added to this

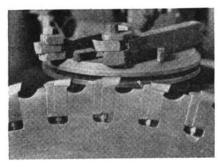


Copy of Norfolk & Western Standard Practice Sheet from which all forged tools are ordered.

is a series of symbols by letter from A to I to indicate the size of the tool and the kind of machine for which it is intended. Tools are ordered both by letter and number; thus an order for a tool No. G23 would call for a rough-

ing round nose tool, right hand, for the planer.

Another source of supply for high speed steel consists in the Disston and Simonds cold saws that are used to cut heavy bar stock. These saws have inserted teeth of high speed steel, each tooth 3.5% in. in size, with a $\frac{1}{2}$ -in. kerf, and when the kerf becomes too badly worn, the tooth is unfit for further use in a saw. The grade of



When cold saw teeth are worn down too far for further use in the saws, they are clamped into the special holders shown here and used as lathe tools.

steel used in these teeth is excellent, however, and when the tooth can no longer be used in a saw, it is clamped into a special holder and used as a turning tool for a lathe or boring mill. When it is too short for further service in the holder, it is thrown in with the rest of the high speed steel scrap and reworked into a smaller toolbit.

In passing it might be mentioned that the heat treating department has many other tasks besides the tempering of lathe and planer tools. For instance, punches are made in thousand lots at the Roanoke shops, and these punches all have to be properly tempered. Dies for the entire system are also made and heat treated here.

Gripper dies comprise an important item for the heat treat department. These dies are first preheated to 1,200 degrees in one of the Westinghouse electric furnaces and are then advanced to the second one where they are brought up to 1,400 degrees. They are then moved to the Glo-Bar furnace, where the temperature is raised to 1,850 degrees, and then they are hardened with an air blast. After hardening, the dies are drawn to 1,000 degrees in the preheat furnace and are held at this temperature for one hour.

Systematic planning of the type outlined above, made effective by the use of adequate equipment, comprises a concrete example of modern industrial efficiency.

Landis 6-In. and 10-In. Type C Plain Hydraulic Grinder No. D-37. Twenty pages of description of the Landis 6-In. and 10-In. Type C Plain Hydraulic Grinders are included in this catalog. which is now being issued by Landis Tool Company, Waynesboro, Pa. book is profusely illustrated, containing not only illustrations of the complete machines in the various sizes, but also photographs of the individual units and mechanisms included in the assembly of the machine. There are several pages of illustrations showing the machines in use for grinding various types and kinds of jobs. The chapter headings are as follows: Landis 6-In. and 10-In. Type C Plain Hydraulic Grinder; Landis Solex Sizing; Grinding with the Wheel Base Set at an Angle; Grinding Motor Armatures and Armature Shafts: Multi-Wheel Grinding; Crank Pin and Eccentric Grinding; Crankshaft Line Bearing Grinding, and Miscellaneous Tables of specifications are included. Copy free upon request.

Whitman & Barnes Alterent Production Reamers. This four-page circular, now being issued by Whitman & Barnes, Detroit, Mich., presents the features of the Whitman & Barnes "Altereut" Production Reamers. Photographs of the reamer and blades, taken from different points of view, illustrate the design and construction of the reamer and the text explains the advantages of the particular type of construction used. The fourth page of the folder comprises a table of specifications and prices. Copy free upon request.



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THE CINCINNATI BICKFORD TOOL CO., OAKLEY, CINCINNATI, OHIO

Armco Apprentice Training Plan Develops Skilled Men

BY EDGAR SCHELLENBACH

IT IS an ironic paradox that the total number of men on government relief rolls remains high in the millions while industry frantically but futilely combs the by-ways of the nation for skilled craftsmen. Personnel chieftains in industry are of one voice in declaring that no employment problem of today is more acute.

Naturally, some industries and some sections are affected more than others. Woes of the depression cast thousands of skilled workers adrift. During the five years of industrial retrenchment, many entered other professions from which they are now reluctant to part. And nature took its inevitable toll of older workers.

Everyone knows the result—an alarming dearth of skilled men to take over responsible plant positions in the face of a rising tide of prosperity. In fact, personnel supervisors declare that an adequate supply of skilled labor isn't available at any price.

Many inquiries were forthcoming last October when The American Rolling Mill Company expanded its apprentice training program. The new training program differs from that previously sponsored by the company in that the courses are conducted in cooperation with the International Correspondence Schools, of Scranton, Pa.

In a few words, the course is a definite outline of work and study, correlated by an individual who has the interests of the apprentice at heart. It is accompanied by a graduated scale of pay for the four year period. At the end is the promise of a journeyman's ranking and the opportunity for promotion to a position of greater responsibility whenever the opportunity presents itself.

The program is under the direction of an apprentice supervisor in each plant. He maintains close personal contact with the individual apprentices and their problems, and is responsible for correlating studies with work in the shops. Textbooks and lesson papers are furnished and examinations are sent to the I. C. S. for correction.

Perhaps it should be emphasized here that Armco is recruiting its apprentices from the ranks of helpers and the employment reserve within the company. In keeping with an Armco policy, the company rarely if ever goes outside its own ranks to obtain men for training in skilled shop work. It has long followed the policy of promoting from within.

Young men selected for enrollment must be between 18 and 20 years of age, and must have a high school education or its equivalent. The present goal at the Middletown Division has been set at 100 apprentices. Applicants are interviewed and rated by a board of three men.

Simplicity is the keynote of the entire training course. It is scheduled to lead the student to the rank of skilled journeyman in his trade within

a period of four years, but where the apprentice shows particular aptitude for both the studies and the required work, he may be advanced to that rating long before expiration of the period.

Operating under the guidance of a foreman and an experienced worker, the apprentice is given to understand that everything he produces during shop hours is expected to be prime work. Armco has found this tends to promote increased interest in the job at hand, along with instilling in the individual confidence in his own ability.

Thus, the program fits in with Armco's general scheme of production. There is no waste motion chargeable either to the company or to the individuals. Four hours' study work at the plant each week is permitted on company time. The class is divided into three groups. From 8 a. m. to 12 noon on Tuesdays, Wednesdays and Thursdays, the groups study in a special classroom set aside for the apprentices. To complete their weekly program, at least 10 to 12 hours is required for home study.

The final hour of classroom study is generally devoted to a round table discussion. At each session a representative of one of the operating departments in the mill lectures on one of the various processes involved in the manufacture of iron and steel, and acquaints the young men with the different kinds of machinery that are required for each process.

Armco is placing much emphasis on personal contacts with the group. At regular intervals the supervisor discusses the program with each worker, makes certain that he is progressing satisfactorily with his lessons, and that he understands fully his prescribed work in the shop.

The total period of apprenticeship is estimated at 8200 hours for the

work schedule, and 800 hours for the study schedule. Each man will be routed from one trade operation to another to get all-round work experience during the scheduled period.

Studies by vocational experts have shown that many workmen in steel mills become skillful in the performance of their duties without knowing much about the science underlying them. The reason for doing things as they do frequently remains a mystery to them. The apprentice study course, however, precludes the possibility of such a situation, insofar as these boys are concerned.

The lessons are arranged for progressive study, each lesson preparing the student for the next in the series. In each lesson is contained the practical information the apprentice needs to fit himself for progressive moves in the steel mill proper.

The apprentice is required to spend certain specified periods on each type of work. For instance, the machine shop apprentice is started on general floor work. Since safety is a consideration of paramount importance in the handling of heavy machinery, the novice is first taught how to handle crane lifts, and the technique of attaching machinery to a crane. Armodeems it essential that he learn the safety routine of the shop under the guidance of an experienced worker.

After four months, the machine shop apprentice is assigned to lathe work. He is started on simple turning and facing jobs, followed with drilling, reaming and boring, and then with taper turning and threading. For each type of work, he must satisfy the foreman that he knows how to perform that particular kind of operation before he is assigned to another task.

Essentially, the company's machine shop is not a production shop, since much of the repair and other work

depends upon happenings in the company's mill. Therefore the company seeks to develop well-rounded craftsmen instead of specialists in certain fields.

For floor work and erection, including babbiting, is set aside a period of eight months; six months for the large lathe; four months each on the radial drill and planer; three months on the draw shaper and boring mill, and two months each for the boring bar and the millers and gear cutters.

The rigger shop apprentice has the following schedule: shop helper, radial drill press, sheet metal and plate work, riveting and bucking, and structural work, three months for each job. Four months are required for both gas and electric welding and work on the roll, shear and punch.

A period of six months is set aside for floor work and shop assembly, including steel body repair, tanks, special machines, guards, and so on. Seven months of the period have been assigned for lay-out, and twelve months for rigging, installation and erection.

Periods of 48 months have been set aside for apprentices working under experienced welders, pipe fitters, electric repair men, blacksmiths, round house, tin shop, carpentry, masonry, steel foundry, heat treaters, electrical construction and pattern shop employes.

There are also courses for apprentices in the mechanical and electrical maintenance departments, in addition to the power and boiler group.

In the course of study, the machine shop group, for instance, has preparatory studies in shop economics, elements of arithmetic, fractions, decimals weights and measures, ratio and proportion, powers and roots, mensuration, formulas and use of trigonometric tables. Further mathematical subjects are optional.

Required subjects for this course include mechanical principles, measuring instruments, elements of blueprint reading, drilling, engine lathes, turret lathes and lathe practice, planers and practice, shaper and slotter work, boring mill work, milling machines, gear calculations and cutting, grinding practices, bench work, hardening and tempering, heat treatment of low-carbon steels and erecting.

One of the features of all courses is a section devoted to the principles of good English.

Thus, the average apprentice will serve for a period of four years. But the program is sufficiently flexible to permit a particularly bright star to complete his apprenticeship in as short a time as two years. The field of 25 starters in the first class last October already is spread out to a considerable degree. Some, of course, are progressing faster than others in both the mill work and the assigned studies.

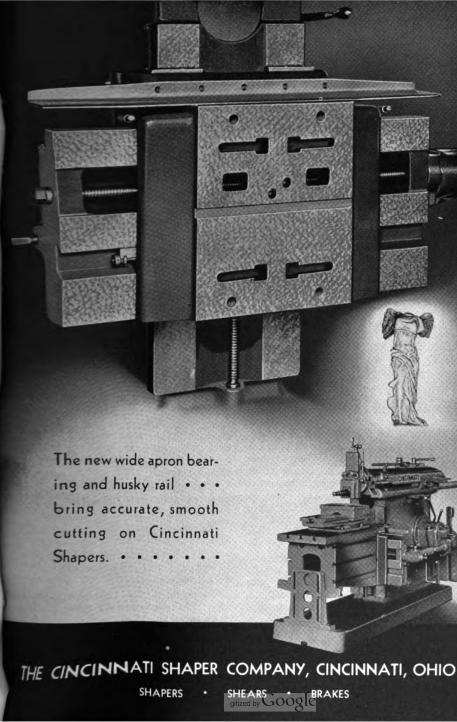
It is required that the apprentice complete two study assignments over a period of about three weeks. After each written lesson, he reports to the supervisor and in a private session they discuss the various problems in the assignment. The papers are them sent to I. C. S. headquarters for grading and record-keeping.

In this manner supervisors can make a constant check on the individual's advancement, find any weak; spots that may develop, and make recommendations for special study in any phase of the work that he does not understand fully.

What has prompted Armco to place so much emphasis on its present. program?

It is a published Armco policy toprovide such training opportunities as will give the individual substantial aid to his advancement.

One of the planks in the written



policies, adopted by the board of directors in 1919, reads: "Armco has, through understanding, fair dealing and mutual confidence, endeavored to gather together a group of earnest, loyal and thoroughly trained men bound together by the enduring ties of mutual interest and opportunity, and their confirmed belief in their ability to succeed in their respective tasks."

Another in the set of eleven policies: "To make every possible effort to develop and maintain a contented, efficient, loyal, aggressive organization, who believe in their company, to whom work is a pleasure, and to whom extraordinary accomplishment is a personal ambition."

Therefore, groups of young men on the employment reserve lists are being given the opportunity to learn a trade. Since about half of the total number of employes in the maintenance departments alone are more than 45 years of age, replacements caused by ill-health, promotion, pensioning and death will be necessary. On the basis of statistics, the average work expectancy of the group is 12 years. The induction of a ratio of one apprentice for each three journeymen will provide just the necessary number of replacements within the next 12 years.

When the work expectancy of shop personnel is put at 20 years for those under 45 years of age, the entire personnel of a given unit will be replaced within that period by inducting a ratio of one apprentice for each five journeymen, when a four-year training program is established.

It is admitted that some shrinkage is likely while the training program is in progress. Therefore it is estimated that 70 per cent of the total number inducted for a four-year training session will still be found on the payrolls after a five-year period.

This 30 per cent loss, it has been found, is caused by resignations, transfers, ill health, and so on, either before or after the apprentice has finished his time. That is, approximately 143 apprentices will be required over a four-year period to develop 100 journeymen.

Obviously, all of the apprentices are not enrolled at one time. One-fourth of the number required are inducted each quarter. Where a part of the requirements are already on the job, the difference between present number and quota are employed on that basis. Replacements are made as apprentices are graduated and placed.

Armco has its program arranged whereby the apprentice, after he has completed the first six months' period, will be entitled to receive premiums for measured work on any job on which he has finished the prescribed number of weeks of training as specified in the program and approved by the Works Management.

Hourly rates of pay for all apprentices who are progressing satisfactorily in both work and study are increased every four months for the first two years of the course, and every six months the last two years of the course.

What does Armco hope for and expect of its apprenticeship training course?

An organization that is favorably apprentice conscious.

That the highest possible type of potential journeymen mechanics will be attracted.

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Magnetic Testing of Welded Seams

By Rene W. P. Leonhardt Berlin, Germany

WITH the increase in the use of welding and the acceptance of this method of fabrication for pressure vessels and other products where not only the efficiency of the product but perhaps the safety of human lives depends upon the efficiency of the

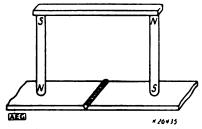


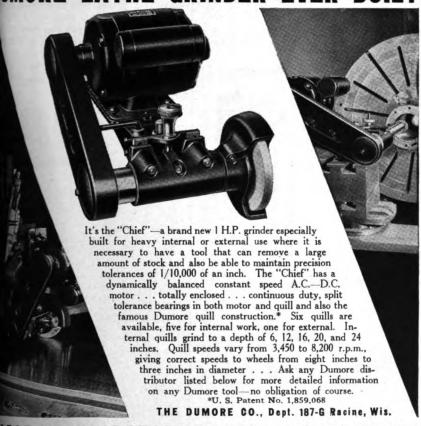
Fig. 1—Diagram illustrating method of mag netizing the test specimen.

welds, it is imperative that the best possible means of testing these welds be developed. In the past there have been two conventional testing methods in use; the metallurgic test and the X-ray investigation. To make the metallurgic test, the weld is first milled out and then ground, polished and etched. The perfectly level surface thus obtained is then photographed with a microphoto camera and a negative is obtained showing the structure of the weld at the magnification selected. The information thus obtained is fairly adequate, but the method takes up a considerable amount of time and in many cases weakens the part examined. The greatest drawback of this method is that tests can only be made at random; consequently

it does not permit of routine testing The X-ray method is also in man cases subject to this disadvantage Testing by the X-ray method is feas ible without weakening the material as no machining is done on the part but it is not always possible with the X-ray to gain access to points where the determination of the presence of welding faults is important. Besides the correct execution and interpretation of X-ray pictures involves much experience and practice, especially at junctions of steel work, and therefore must be entrusted to experts. Further considerable time is lost in preparad tory work.

In an effort to develop a method of testing welded joints of such nature that the apparatus required will be comparatively simple, the tests positive, and which can be applied as routine operation, the Allgemeine Elektricitats-Gesellschaft has, in cooperation with the I. G. Farbenindustrie A. G., developed a magnetic test for this purpose. By using the magnetic method, the tester can immediately determine the strength properties of welded construction without the use of photographic apparatus. Moreover, the welded seams are not weakened by machining. The magnetic test is not altogether new, but despite its advantages this method has hitherto failed of universal acceptance in German welding shops, due perhaps to the fact that the electro-magnets used in conjunction with former methods were large and cumbersome, which

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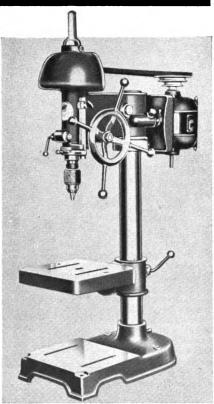
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limited their field of application.

To inspect a weld made in join two steel plates—to assume a sim example—the first step is to mag tize the plates by placing two pern nent magnets at the right and lof the seam. The magnets can also joined together by a yoke. If course of the field between the

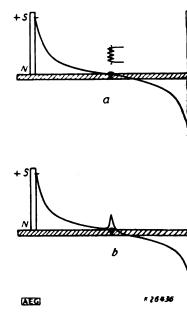


Fig. 2—(a) Chart record of a perfectly joint. (b) Chart record showing def welded seam.

magnets is plotted by means of a strument, an undistorted curve i tained if the welded joint is pe However, if there are defects su bonding faults, shrink holes, c and so on, in the seam, addi stray fields will be set up which voke a distorted field curve.

To detect such defects, a coil is moved to and fro in movements at a certain speed field. A voltage is thus inducthe coil which corresponds t

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alteration of the components of the magnetic field in the direction in which the coil is moved. If the field range is steady, which would be the case if the weld is perfect, the induced voltage in the coil remains uniform. Conversely, if there are defects in the welded seam, the voltage in the coil



Fig. 3—Probing Device. B—Sockets for connecting headphones. K—Head with search coil. M—Magnet for exciting of search coil.

varies in accordance with the variations in the solidity of the field.

Diagrammatically a defect in the weld will be represented on the chart by the appearance of a small peak in the field curve. The alteration in the shape of the curve is occasioned by the alteration in the amplitude and

by the harmonics of the induced voltage. These electrical phenomena are rendered audible to the tester through the medium of headphones.

The head of the probing device includes a search coil which is set in vibration by a self-contained magnet connected to obtain across-the-line voltage. In order to be able to test not only simple butt and filet seams, but also

inconveniently positioned joints, the head of the prober is made adjustable so that the search coil can be moved in any desired direction relative to the operating magnet. The practical shape of the prober permits of testing welds in difficult locations where they would be impossible to test by other means. The long connecting cord — usually approximately

5½ yards long—gives the tester am; freedom of movement.

The weak tones produced by t current impulse induced in the sear coil when testing are amplified in valve connected across the lighting mains. Two sockets are fitted to t prober for connecting the headphone The degree of magnetization produc by the two permanent magnets comparatively weak but is entire adequate to carry out all tests. A components of the testing outfit—t magnets, amplifier, headphones ar cable connections—are lodged in portable desk which, owing to i light weight (74 pounds), is ver easily moved.

Power for operating the instrumer is obtained from the lighting circuit for which an extension cord and cab is supplied. The headphones are con nected to the prober, and the probe in turn, to two contact sockets on the desk. The amplifier is then switched

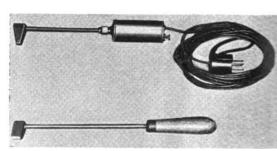
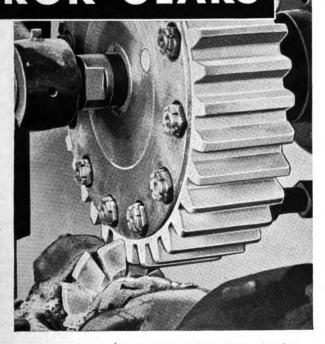


Fig. 4--Magnetic Probing Device.

in, and the instrument is ready to use as soon as the welded seam habeen magnetized by the use of the two magnets. Upon guiding the probes slowly to and fro over the welder seam, defects in the weld are instantly located by the alteration of the volume and timber of the sound produced in the phones.

The magnetic testing method does

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THERE is no denying the fact that INSUROK silent plastic gears (non-metallic) deliver greater gear value per dollar invested. This is because INSUROK possesses in a higher degree those qualities of durability, toughness and wearability that insure longer life and freedom from costly, frequent replacements. Learn how the superior performance of INSUROK gears can be turned to the gear cutter's profitable advantage.

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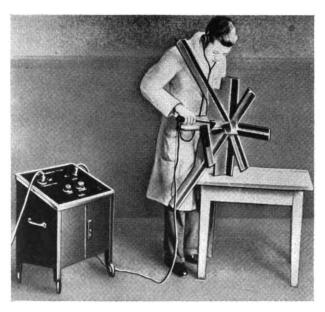


Fig. 5—Using magnetic testing outfit to inspect welds in steel construction.

not provide a direct picture of the structure, but detects the existence of defects and their locations. With a little experience, the operator will be able to interpret the character of the defect and thus the characteristics of the seam itself. After the locations of the defects in the welded seam have been established, random

tests can be mad with the first tw methods in order t ascertain whethe the prevailing faul is of a serious an dangerous characte and whether it re duces the strengt of the constructions part. The compara tive simplicity an cost of the magneti testing of welde seams will, however make it possible t apply this test as routine operation and thus induce the welders to exercis the greatest care in their work.

Apart from dis closing welding de fects, the magneti tester described her is also capable of de

tecting other faults in metal products. Thus it can be used to detect possible faults due to rolling operations, slag content, alterations in structure due to tempering, corrosion and so on. It can also be used to detect cracks in metal products where the design is such that the faults could be ascertained by no other method.

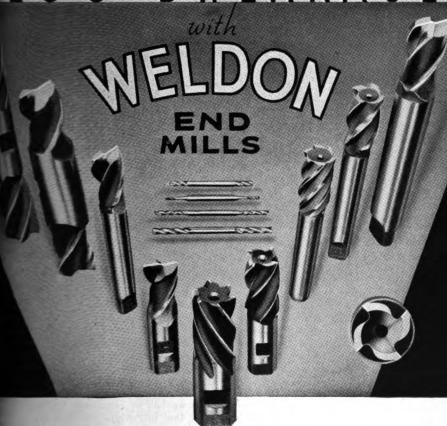
APOLOGIES

In the fourth section of Walter L. Tann's article "Hydraulic Power and Its Application to Modern Industry", which was published in the June issue of this magazine. Figures 2 and 23, which were illustrations of a radial piston pump, should have been credited to the Northern Pump Company, and Figures 24, 25, 26, 27 and 28, which were views of the hydraulic equipment employed in the operation of the stage elevators and orchestra elevator in Radio City Music Hall, should have been credited to Peter Clark, Inc.

Rivets. Price List No. 29 of the tubular and split rivets made by Chicago Rivet & Machine Co., 1830 S. 54th Ave. Cicero, Ill., is now being distributed by that firm. All of the various types and sizes of steel tubular and split rivets, rivet caps, brass split rivets, brass tubular rivets, and iron tubular rivets made by this firm are included, with prices. A table of charges for plating rivets is also included. Copy free upon request.

Mention MODERN MACHINE SHOP when writing to advertisers. Your cooperation will be appreciated both by the advertiser and this magazine.

ESS BREAKAGE



No nicks to weaken teeth on the end of the mill.

No pockets in which chips can clog; heavy feeds will not clog the end of the mill.

Formed flutes, designed for greater strength, yet with plenty of chip clearance.

Tools are carefully heat treated in order to obtain a certain characteristic grain structure.

A complete line of endmills, a design for every job.

If you use endmills, Weldon can help you!

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New Firth-Sterling Plant Mode of Modern Factory Construction

Beauty and Efficiency are Combined Through the Use of Gla Bricks, Stainless Steel, Plate Glass and Aluminum

MANUFACTURING plant in in which all of the newest practical ideas in factory design are embodied—as modern as the sintered carbides which will be produced within its walls-has been completed and opened by the Firth-Sterling Steel Company at McKeesport, Pa. Surrounded by a garden, the structure is distinctly modernistic in design, and such decorative materials as glass brick, plate glass, stainless steel, Carrara glass and aluminum have been used in its construction. These materials were used in order to achieve the strict, ideal working conditions necessary for the production of sintered carbides. The entire factory has been designed to achieve the utmost in light, cleanliness, temperature and dust control.

The building is two stories high, the main section being 220 feet long and 70 feet wide. An office wing, extending from the center, contains a lobby and display room. Here plate glass windows provide ideal working light, glass brick is used for st wells and interior partitions, and offices are soundproofed by using separated double glass partitions. Some of the rooms have terrare floors, Carrara glass walls, and lir leum ceilings; thus every surface must be washed to eliminate the possibility of the intrusion of foreign matter which would cause defects in the finished tools.

A dust filtering ventilation systemas been provided as a further procaution, and provision has been made for the future installation of an aconditioning system.

The new building has been designed to permit efficient and orderly production, the elimination of wasteful hardling of materials, and time losse. The manufacturing departments have been equipped with the most moder machinery and equipment, essential the intricate processes of manufacture of the product.



1510 "Unshako" t out section shows the ocking Ring in position.

SELF - LOCKING NUT with a GRIP that Really Holds

Once in, no amount of jarring or vibration can loosen the UN-SHAKO Self-Locking Nut. (Yet, it backs off easily with the aid of an ordinary wrench.) The built-in, self-locking ring or floating thread holds it fast (without fuss with straying pins

or washers) and absolutely prevents accidents and failures from loosened nuts in vibration wracked machines.

Complete information and prices cheerfully furnished.

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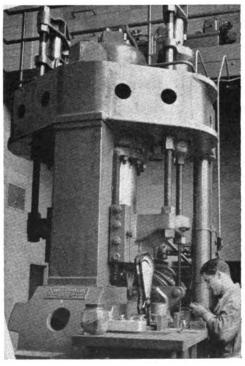
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ST. LOUIS SAN FRANCISCO

STANDARD	PRESSED STEEL COMPANY Box 556, Jenkintown, Pa. Send me—without obligation—ALL the facts about "Unshako".
Mr	Title
Firm	

Upon entering the building, one passes through a hallway formed by glass brick partitions, directly into the lobby. Here are display cases containing a variety of finished tools and dies as well as specimens of Ferberite ore (Iron tungstate). This ore is



A view of the 400 ton two-way press where powders are compacted into the shape approximately 20 per cent larger than the finished blanks or nibs. Pressures range from 4,000 to 60,000 pounds per square inch of surface.

mined on the company's properties in Colorado, by the Wolf Tongue Mining Company, a wholly owned subsidiary. The tungsten is put through a chemical process of refinement in the company's laboratory at McKeesport.

The first step in the manufacturing process is the carburizing of the pow-

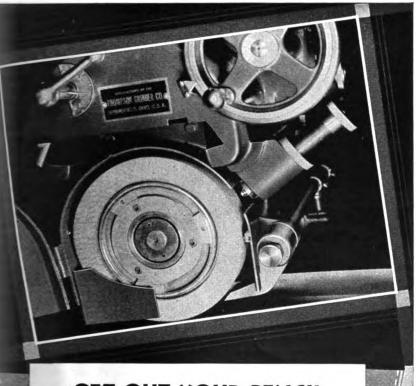
ders after which they are transfer to the mixing room. In this room p vision has been made for the matenance of absolute cleanliness, sential to the manufacture of product. The walls are of Cart glass; the ceiling and floors of war

proof material; the bench steel; and the equip throughout is of material can be washed and cleaned: ily in order to eliminate danger of the powder being taminated. Carburizing complished by heating a mi of carbon powder and me powder tungsten temperature in a non-oxi atmosphere. The resultant bides are crushed by ball n and returned to the mixing where they are combined tantalum carbide, titanium bide and cobalt powders. are then mixed in variou portions to produce the di grades.

In a stainless steel fisink located in the center room, distilled water is add the charge or mix. Later milled charge is brought and the greater part of water filtered off. After ing the powder is dried in mostatically controlled bovens, mixed with cobalt ders, and delivered for a ball milling.

The ball milling room is different from the mixing Here the process is exmechanical. The containers at upon machines of special design which the charges are rolled or bled continuously for days.

Another purpose of milling coat the hard particles of carifa metal binder such as cobalt this the milling or rolling mu



GET OUT YOUR PENCIL

While there are several notable features on the Thompson grinder, one in particular stands out . . . the way the wheel is trued.

Every time the wheel moves to its rear position it passes the sizing diamond and is automatically redressed. Not even a fraction of a second is lost.

Compare the Thompson time saving wheel-truing method with the way wheels are redressed on other grinders. Get out your pencil and estimate the superiority of the Thompson way over ways that slow the work and retard production.

THE THOMPSON GRINDER COMPANY
SPRINGFIELD, OHIO

THOMPSON



A general view of a shaping room in which materials in their pre-sintered condition are be shaped. In this department, all machines are equipped with exhaust fans.

tinue until every particle is coated to an extent that will give the desired binder content in the finished product. When the milling is complete, the charge goes back to the mixing room where all trace of water is removed.

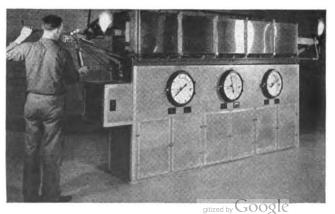
In the manufacture of Firthite and Firthaloy, these ball mill batches are comparable to the "heats" of a steel mill and the identity of each is preserved throughout the process so that the mill number upon a finished tool or die permits tracing of the material back through every step to the mixing of the powders.

The powder mixture then goes to

a two-story room containing a 400 to two-way press for large production pieces, and a small press for compaining smaller units such as individual blanks or nibs. Here the proper quatity of powder mixture is weighed accordance with the piece to pressed and the mixture is then spreauniformly in a mold or die.

So as to allow for a surprising shrinkage in all dimensions in the final sintering, all molds are made sizes and shapes to produce piece approximately twenty percent large than the finished product. The moulance of a type which can be complete

disassemble without affection



Charging pressed blets into a lew terperature sintering furnace which is a tomatically controlle for temperature for bydrogen an stoking speed.



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FOR THE CONTROL OF SINGLE AND DOUBLE ACTING CYLINDERS

Poppet Type—Simple in design, lightning swift in operation. The speediest valve obtainable. Hand, foot, mechanical and solenoid controlled types.

All ports on one face. Piping permanently attached to compect bracket mounting, making installation simple and servicing easy.



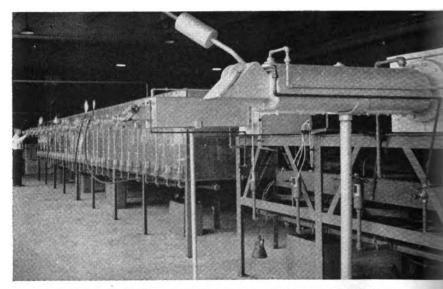


Economical Resilient Gasket

ROSS OPERATING VALVE COMPANY

6488 Epworth Blvd.

Detroit, Michigan



One of a battery of high temperature hydrogen atmosphere sintering furnaces.

in any way the compacted blank which is very fragile in spite of the great pressure to which it has been subjected. Pressures range from 4,000 to 60,000 pounds to the square inch of surface depending upon the type of material and the size and shape of the blank.

The next step is to give the compacted piece a preliminary heat treatment. It is put through a "presintering" furnace having three electrically heated sections in which a hydrogen atmosphere is maintained throughout. Temperatures are indicated on large dial pyrometers. The fragile blocks are placed upon graphite slabs and heated to a temperature at which the metal particles coalesce and make a somewhat less fragile piece with a chalk-like hardness. The piece when cooled, is then ready for shaping.

In the shaping room, glass walls have been installed as well as easily cleaned floors and ceiling. In this department the atmospheric problem is the opposite of that in the mixing room. Here the problem is to kee the air clean for the benefit of th workers. Every mechanical shaping device is equipped with exhaust fan to remove all particles of fine dus produced by cutting the rectangula and cylindrical blocks to the variet and intricate shapes and sizes used in tools and dies.

When the piece is shaped it is ready for sintering, the process of heating to the melting point of that metal in a compound which melts first, and thus becomes a binder for the other unmelted particles. Special furnaces have been designed and built for the sintering process in order to insure a hydrogen atmosphere. The heating chamber of these furnaces is an alundum tube, wound with a resistance wire (molybdenum) which permits accurate control of temperature. A water cooled section adjoins the heating tube so that rate of cooling is also controllable. The shaped pieces are packed in carbon "boats" with carbon



The hand that writes your power drive specifications also writes, for better or for worse, the performance of your machinery and plant equipment. More is at stake than the choice of any particular drive, because losses in machine production and efficiency can be traced in many cases directly to the drive between the motor and the machine.

Why are Whitney Chain Drives the choice of so many leading machinery builders? Because they give maximum power to the machine with minimum frictional losses and because they do not depend upon excess belt tension and bearing loads to give efficient operation. In other words, they allow the full machine capacity to be realized.

Another interesting fact about Whitney Chain Drives is their economy. Due to the generous use of heat treated alloy steels and precision manufacturing methods, Whitney Chains stand up under the most severe operating conditions, and pay their cost many times over in freedom from breakdown and production losses.

Write today for further information on the Whitney line which includes Roller Chain, Silent Chain, and Flexible Couplings. Our engineers are always ready to make recommendations. The Whitney Chain & Mfg. Co. Dept. B-2, Hartford, Connecticut.

powder for uniform heating. The boats are introduced in a preheating section of the tubular furnace and then mechanically stoked or pushed through the heating and cooling sections, always in a hydrogen atmosphere. After sintering, the pieces have attained their final hardness and are ready to be used in a tool or die.

Each six-pound batch is carefully controlled for hardness, specific gravity, resistance to cross breaking finish Firthaloy Carbide Dies in t many shapes and types required the ever increasing use of drawing a means of shaping metal.

The Brazing department is one the most important in the plant cause the carbide blank or nib usually mounted in a holder or cas and the accepted method of secur is by brazing. Specially design electrically heated, hydrogen atmosphere furnaces are used. These



Brazing Department—Here Firthite tips, which form the cutting edge of tools, are attache strong steel shanks. Pure copper is used as a solder, and brazing is accomplished in the furn shown in the photograph. Temperature is maintained at 2,050 degrees F.

stress, and microscopic structure.

The carbides are then sent to the tool or die shops. One end of the first floor is the Firthite Tool Shop, where finished tools of all kinds are made for users who are not yet equipped to make their own from the Firthite blanks. In the tool shop, the machinery does not differ from that of any up-to-date tool making plant, except in the grinding where diamond wheels are used in a number of the finer operations.

On the other half of the floor is the Firthaloy Die department where there are machines specially designed to

naces are also sold to customers make their own tools. Copper is preferred brazing material, altho for some purposes tips are fixed v "silver solder". The brazing of on tools supplied to customers c pletes the line of forms in which carbides are supplied.

Types supplied for cutting called Firthite, while those supplied for drawing or forming are of Firthaloy. Wear resisting partiple made of either Firthite or laloy, and offer an undeveloped tensive field for the use of simple metal products.



machine applications. Consult our Engineering Department for details. Special tools to your blueprints, or specifically designed to meet your needs, are available.

Years of accumulated experience in the designing of standard and special cutting tools is at your disposal without obligation. Write for a catalog of the Gairing line on your company letterhead.

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In the 10 years that have passed since tungsten carbide tools were introduced in this country, they have brought about changes in machine tool design, improvement in shop processes and made possible the commercial use of new materials. Although the selling price of from \$200 to \$400 a pound seems extremely high. the net result of the growing use of this new material is to reduce the cost of many necessities and luxuries bought by individuals and equipment supplied or bought by industrial institutions.

Hand Propelled Cleveland Tramrail Carriers with Motor Operated Hoists. This six-page folder, printed in colors. describes and illustrates a wide variety installations in which Cleveland Tramrail Hand Propelled Carriers with motor operated hoists are used. It also explains the design of the hoists and illustrates, by means of photographs, the various parts which enter into the

construction of the hoist.

Not the least interesting are the vari ous types of hooks, baskets, and othe types and designs of equipment for lift types and designs of equipment for lifting and transporting workple-sa, material in lump or powder form, foundarflasks, sheet metal, lumber, ladles, wirrope, dipping baskets, pipe, paper rolls and so on. Copy free by addressin Cleveland Crane & Engineering Co Wickliffe, Ohio.

Thor Steel Letters and Figures. Th complete line of steel letters and figure made by the Pittsburgh Stamp Com pany, Inc., 812 Canal St., Pittsburgh Pa., is described and illustrated in 20-page catalog now being distribute by this firm. In addition to presenting pictures and descriptions of the variou types and sizes of steel marking stamp made by this firm, the text includes discussion of the manner in which th letters and figures are cut, the stee used in these stamps, the hardening procedure, and the manner in which steel stamps should be handled to obtain the best results. A table of sizes and prices is also included. Copy free upor request.

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THE BOYE & EMMES MACHINE TOOL CO. CINCINNATI OHIO

"The Lathe With Th



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The Standard of Value

Quality inside and out!

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After you have made your test, you will agree Holo-Krome FIBRO FORGED Socket Screws are the Standard of Value.

FREE TEST OFFER

Write our Department H giving style, size, and quantity, and the screws required are yours for the writing.

THE HOLO-KROME SCREW CORP. Hartford, Conn., U. S. A.



Use Standard Rather Than Special Motors

By A. C. DANEKIND (Read at General Electric "Speed Show" in Cincinnati May 24, 1937.)

THERE is no questioning the fact that much progress has been made by the machine-tool industry, for users are showing a rapidly accelerated desire to purchase equipment which will reduce both set-up time and the degree of skill necessary to operate the machine.

I note with considerable concern, however, the ever-increasing number of special motors which are appearing in recent machine designs. While it is a fact that the use of these motors is confined, for the most part, to fractional sizes which are used for auxiliary purposes, there are any number of glaring examples where a perfectly standard N.E.M.A. motor might have been applied if proper thought had been given the subject by the designer and the electrical application engineer when the machine was in the lay-out stage. Mechanical rather than electrical limitations in standard motors is apparently a designer's justification for selecting special motors for meeting specific requirements or conditions. All too often, however, co-operation with a capable electrical application engineer, when the machine was being laid out on paper for the first time, might well have overcome the necessity of resorting to the use of highly special electric equipment.

N. E. M. A. standards were established at the request of the Machine Tool Builders Association . . . and users of machine tools have every reason to prefer equipment operated

by standard electric motors and machine-tool designers have every reason to adhere to established standard insofar as possible.

Centralized control and motor driven auxiliaries require adequate in terlocking. I believe it advisable for machine-tool designer to assume that if the control is arranged so that it can possibly cause a breakdown through mishandling of the controlling mechanism, it will probably be done and done shortly after the machine has been put in operation. This is the period when the machine will be under the closest observation by management and is, therefore, the time when the machine-tool designer's efforts are being appraised. It is unquestionably the job of the electrical application engineer to work in close co-operation with the machine design: in order that possibilities of bieakdowns due to electrical limitations can be detected and eliminated. The cost of a few extra interlocking circuits is good insurance if they will definitely accomplish this result.

The primary objective of a machinetool designer is to provide equipment which offers increased output capacity, ease of operation, simplicity of construction, and low-cost maintenance. The use of electricity rather than mechanical contrivances for driving and controlling a machine is definitely a more satisfactory means to that end. Electric equipment has grown to a point where it represents a very substantial portion of the toComplete Line Of

High Speed Steel

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SIMONDS

"RED END"

HACK SAWS

for every metal cutting job

Now you can get Simonds "Red End" Hack Saw blades in three qualities for hand frames and power machines to cut every kind of metal straight and fast and at lower costs.

SIMONDS SAW AND STEEL CO.

tal cost of a machine, and presentday mechanical design problems require particularly judicious application of electric motors, controls, and accessories.

Conditions under which machine tools are operated are usually severe. In view of these conditions-all of which are outside the control of a designer of machinery-it seems quite obvious that the success of any electrically operated machine depends in a large measure on the fullest cooperation between the machine designer and the electrical application engineer while the design is in the lay-out stage. Unless this is done. operating limitations may well develop to place the machine-tool builder's reputation in a particularly vulnerable position.

Machine tools are nothing but contrivances by which energy may be either transferred or transformed. themselves, they are just combin tions of mechanisms; hence in us and from an operating viewpoint, the are exposed to all the wiles of huma attention. A machine-tool design must expect his product to be su jected to severe operating condition He must go to extreme detail in gi ing consideration to every mechanica hydraulic, or pneumatic principle his command in an effort to obta the ultimate in his machine. An ele trical application engineer, by the same token, has a very definite obl gation in properly applying electr motors, controls, and accessories the designer's mechanism. Only b full and wholehearted co-operation be tween the two can machine tools l produced which will meet complete management's present-day conception of what constitutes adequate efficien equipment.



SIDNEY TAPERED SPINDLE NOSI

SIDNEY has now adapted the standard tapere spindle nose as optional equipment on the Tritrol 16-speed, Sidney 12-speed and SIDNE Precision Tool Room Lathes.

Advantages: More power — greater ease is removing face plates and chucks—brings face plate and chuck closer to the front spindle bearing.

Write for further information.

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THE SIDNEY MACHINE TOOL - CO.

6-INCH JUNIOR \$19.95

A full quality ball-bearing unit, priced so you can spot several in your shop; for intermittent tool sharpening, light grinding, wire brushing; ¼ H. P. constant speed motor; ball bearings; light, strong alloy housings; adjustable tool rests; wide grinding wheels; rubber covered cable with plug and ground wire.

Modernize your
Grinding Equipment

To CUT PRODUCTION AND
MAINTENANCE COSTS

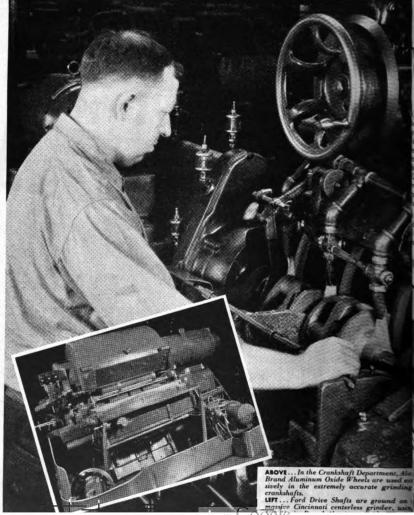
WIDE-TYPE, HEAVY-DUTY, BALL-BEARING GRINDERS with extended spindles and tapered housings, simplify handling large and awkward pieces. Completely enclosed wheel guards comply with safety regulations; tool rests and spark shields adjustable for wheel wear. Grease-sealed ball bearings minimize vibration. Three powerful models for heavy-dutywork: 6-Inch (1/3 H.P.); 8-Inch (1/4 H.P.); 10-Inch 1 H.P.).

You'll find exactly the Bench Grinder you need for every type of shop work in the new Black & Decker Bench Grinder Line. Check over your grinding operations. See how many ways Black & Decker Grinders can speed production and maintenance work. Then ask your Jobber for a demonstration, or write for catalog. The Black & Decker Mfg. Co., 720 Pennsylvania Avenue, Towson, Maryland.

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World's Largest Manufacturer of
PORTABLE ELECTRIC TOOLS

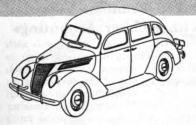
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trial art of grinding has been a potent factor ssible the fast and economical producide of interchangeable parts to close tolerances. Grinding has put craftsman-is production. One of the greatest institu-momotive industry, one of the greatest the Carborundum Company is proud that it serves Ford in so many ways, on ety of grinding, finishing and polishing so in the sanding of car bodies.

Cincinnati centerless grinders, wheels by shafts. In the Crankshaft Department, and Aluminum Oxide wheels are grinding thousands of the extremely accurate Ford crankshafts.

Wheels by Carborundum equip many of the machines used for centerless grinding of pistons and are employed in grinding to extremely accurate size and high finish many of the massive rolls used in the rolling of steels.

Then, too, the perfect finish and high accuracy of Ford cylinders are produced by honing. Many of the multiple spindle machines are equipped with Carborundum Brand-Hutto heads fitted with Carborundum Brand Silicon Carbide sticks.

All of these accurate grinding operations reflect the high standards of Ford production methods, the Ford ideals of quality workmanship always back of their great production of a great car.

CARBORUNDUM COMPANY . NIAGARA FALLS, N. Y.



used in the rolling of sheet steels are ground ely accurate size and high finish.

Wheels by Carborundum equip many of the machines used for the centerless grinding of pistons.

CARBORUNDU

PRODUC

Modern Equipment at Work

Timken Combats Vibration With Rubber Mountings

THUMP, thump, thump—with every thump a bearing cage is blanked and drawn out of ¼-inch strip steel by one of the several large punch presses operating in the Canton plant of the Timken Roller Bearing Company. Although these press units are mounted on individual cement foundations extending down several feet into the ground, the vibration resulting from their operation is quite noticeable in surrounding parts of the plant.

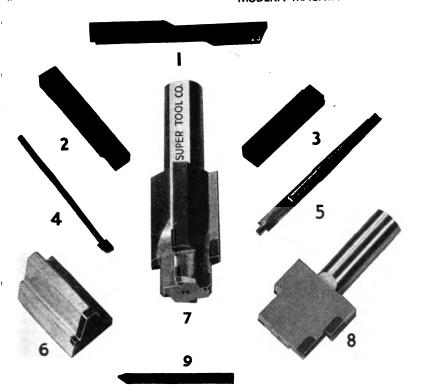
Rubber mountings make it possible to operate this machine in close proximity to several heavy stamping presses without disturbing the setting of the indicators.

Despite this condition, Timker successfully operating a battery bearing grinders in a section of immediately adjoining pressroom. These machines are for the precision grinding of bear and work on them is held to a ten thousandths of an inch. The q ator is able to maintain this low erance limit by means of an ind ing gauge on the machine. If jected to the slightest amount of bration, the gauge reading would thrown off by several thousandth an inch and would necessitate quent removal of the bearing

the machine for nuring purposes.

To eliminate any sibility of such dis ance, Timken engil have mounted som these grinders on ble shear type rul to - metal mount known as Vibro-These m lators. ings, which were d oped by The B. F. (rich Company, ar tached by simply ing to the base o machine. One of grinders is show the photo. Thou tests show that g readings are in no affected by the rounding vibration

Another unique plication of Vibsulators in the Ti plant is their use motor mounting



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- 5. Combination Drill Counterbore.
- 6. Form Tool.
- 7. Four Fluted Step Reamer.
- 8. Flat Drill.
- 9. Glass Drill.

SUPER TOOL COMPANY

356 EAST CONGRESS ST. . DETROIT, MICHIGAN

large vertical grinder which is used for grinding large bearing cups and cones. Power for the grinding or ation is supplied by a 10 hr motor mounted on the spindle Lousing. To forestall the possible cransmission of vibration from rotor to the spindle grooves were machined in the spindle housing and the motor was mounted on Vibro-Insulators without change of position.

Besides these two successful installations, Timken engineers have found many other uses for these rubber mountings. In addition to placing under motors and machines, they have also used them with success as mountings for several pieces of delicately adjusted laboratory equipment which are highly susceptible to vibration.

Diamond Bores Hole Through 12 Miles of Aluminum Alloy

THE tremendous amount of work, from the standpoint of wearing quality, of which the industrial diamond is capable is indicated by the production record of a Koebel Diamond Tool used on an Ex-Cell-O boring machine in a Detroit automobile The operation was taking a finishing-cut on the wrist-pin holes of aluminum alloy pistons. The point of this diamond weighing less than one-half carat bored more than 200,-000 pistons before it had to be reshaped. The total length of "hole" represented by these pistons if placed side by side would be approximately twelve miles. The total length of chip removed was more than 9000 miles, or approximately three times the distance across the United States! In this operation dimensions were held to an accuracy of .00015 inch.

This record is the more impressive because of the abrasive character of



This diamond bored more than 200,000 pin before it had to be reshaped.

the piston metal, and of course, exafter this period of service the comond was in no sense "worn out". required only re-lapping to the corect radius to prepare it for a similar period of production life.

Westcott Chuck Catalog No. 537. 7 catalog, now being distributed by We cott Chuck Company, 700 E. Walnut Oneida, N. Y., contains descriptions the line of lathe chucks made by t firm in a complete range of sizes a types for direct mounting on standifianged spindle noses and on standitapered key drive spindle noses. 7 book contains 42 pages, 8½x 11 in. size, describing the Westcott I.X.L. Inc pendent Lathe Chucks, Westcott Be Geared Scroll Universal Self-Centeri Lathe Chucks, Westcott Spur Geal Scroll Combination Lathe Chucks, We cott Light Duty Lathe Chucks in inc pendent and universal types, and We "Little Giant" cott Two-Jaw Chucks. Complete descriptions illustrations of each type of chuck s included, together with tables of spec fications and current chuck prices.

Copy free upon request.

Lewis-Shepard Skid Platforms. To many types of Skid Platforms that me be used in conveying materials, good merchandise, parts and products by the lift Truck method of interior transpotation will be found fully illustrated a new colored folder, No. 146, just is sued by Lewis-Shepard Co., 175 Walnington, Mass. Copy free upon request.

"HE'S DOWN IN THE PLANT TODAY"

More Than Ever Before Top Executives Are Back Scrutinizing Every Plant Operation

Finding Out:

- 1 WHY power costs so much.
- 2 HOW to cut down their annual maintenance costs.
- 3 WHERE to speed up daily production schedules.
- 4 WHAT will lower oil

FOR 71 YEARS the makers of Gargoyle Lubricants have been helping the men who own plants... the men who run them. This experience—the greatest in the oil business—can be put to work in your plant... increasing manufacturing profits.

Take a Socony-Vacuum Engineer into your confidence. Let him discuss a program of planned "Correct Lubrication" with your capable plant men. Together, they may be able to devise ways and means of gaining more efficient production.



SOCONY-VACUUM

INDUSTRIAL LUBRICATION



SAVES MONEY FOR INDUSTRY Careful selection of the right kind of lubricants for all types of power and production equipment...curbing losses are waste of power generated or purchased.

2 Proper methods of application... the right oil in the right amount... aiding higher machine speeds...less spoilage or rejects... protecting investments in machinery.

THE SUM OF THESE FOUR SAVINGS

- 1. REDUCED POWER CONSUMPTION
- 2. MORE CONTINUOUS PRODUCTION
- 3. DECREASED MAINTENANCE
- 4. LOWER LUBRICATION COSTS

= CORRECT LUBRICATION

3 Experience in dealing withindividual operating conditions... correction of out-dated practices often resulting in excessive repair and replacement costs.

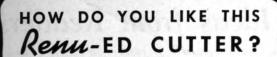
A planned lubrication program . . . quality lubricants where necessary . . . other lubricants where use will provide economy and not handicap machine efficiency.

SOCONY-VACUUM OIL CO.

INCORPORATED

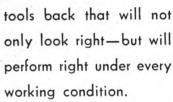
ANDARD OIL OF NEW YORK DIVISION - WHITE STAR DIVISION - LUBRITE DIVISION - WHITE FACILE DIVISIO



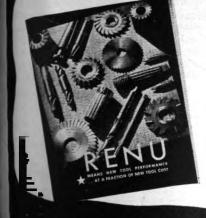


TOOL THAN MOST
NEW ONES

When you send worn out tools to RENU to be reclaimed, you can rest assured you will get



 A new catalog, outlining this money saving service in detail, is available for the asking. Write



ense TOOL CO., 275 E. Milwaukee Ave., DETROIT

Ideas from Readers

This department is a clearing house for ideas . . . If there is a "kink" or short cut in use in your shop, send in a description of it . . . Each one published will be paid for.

Metal Case for Drawing Paper and Tracing Cloth

By J. J. THOMPSON

THE drawing presents the design of a case that was made primarily to keep tracing cloth and paper clean. Properly constructed it will, no matter how dirty the office is, keep the contents clean. Any draftsman who has worked in a foundry, shipyard or machine shop appreciates the almost impossible task of keeping coal dust from sifting through drawers. Tracing cloth is expensive, and yet yards and yards of it are cut off and thrown away because it is not usable. The use of this case will prevent this waste.

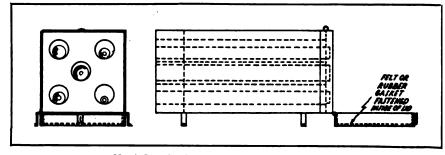
The case is cylindrical and is constructed similar to the flues in a locomotive boiler. Tubes of tin are formed and soldered to sheets of tin, which sheets in turn, are soldered inside of a rectangular box of wood or metal. The box has a hinge cover

at the end, inside of which is a gasket of felt or rubber. When the cover is hinged, the box is sealed. Aside from this important feature, the box offers an opportunity for having all such materials close at hand. It can be fastened in horizontal or vertical position to any available space on or near drawing board. This box is 14 in. square and 42 in. long, and the tubes are 4 in. in diameter. This size was adopted as best suited for standard drawing supplies.

Wire-Tension Device

BY CHAS. H. WILLEY

HEN winding coil springs in the lathe from small size wire, it is usual to guide the wire and at the same time apply the correct amount of tension by allowing the wire to pass between two pieces of leather—usually old leather belting—held in the hand. However, there are times when more pressure, or means for applying it more evenly, is necessary. In such cases the device shown in the



Metal Case for Drawing Paper and Tracing Cloth



small low-priced, dry-cutting hack saws too, MARVEL dominates the field-80% in use are MARVELS.

These economical general purpose saws No. 1 and No. 2 are sturdier, with heavy rigid saw frames, hold blades at greater tension-assure straight cutting. All controls are set in front for convenience and safety, and frame slides in "V" bearings that have screw take-up to compensate for wear. They

are in every way "more saw for the money." Equipped with unbreakable Hack Saws can be counted on to keep producing hour after hour, day day.

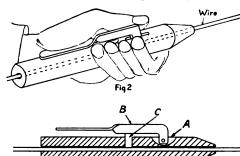
ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People" 5845 Bloomingdale Ave. CHICAGO, U. S. A.



illustration is worth all it costs to make.

The device consists primarily of



Drawing of Wire-Tension Device for Making Coil Springs in the Lathe

a piece of %-in. round stock through which a %-in. hole has been drilled lengthwise. A slot is milled as indicated at A, in which the end of the lever B is pinned by drilling a hole

crosswise. At C a 5/16-in. hole is drilled to receive a soft brass plug that is made to a sliding fit in the

hole. The lever B can be made from sheet steel 1/16 or 3/32 in. thick, shaped as required. The 5/16-in. hole for the brass plug must, of course, be in line with the slot in which the lever is pinned.

With this device a considerable amount of pressure can be exerted with practically no effort, and the pressure can easily be regulated as required.

Combination Depth Gage and Scale Clip

THE drawing illustrates a handy "kink" that I have used many times, consisting of a scale clip that can also be used as a depth gage. The



ATKINS

Hacksaw economy is not a matter of price... durability, quality and actual efficiency must be considered. In Atkins Silver Steel Saws you get them all.

- Extra hours of accurate cutting.
- Uniform temper.
- and "Teeth that Bite" . . . quick . . .
 smooth and clean.

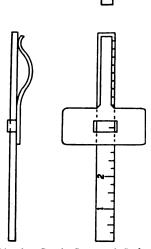
analysis...tests and improvements have established Atkins Silver Steel Saws as leaders in every field. See your distributor and make your own tests.



E. C. ATKINS AND COMPANY · INDIANAPOLIS, INDIANA

ATKINS SILVER SAWS

clip is made from a short length of spring steel, shaped in the form of a letter T. The vertical section of the T is bent to form a clip for holding the scale in the pocket. A rectangle in the cross section is marked off and three sides are cut loose so that a



Combination Depth Gage and Scale Clip

tongue will be formed which can be bent to hold the scale, the tongue being adjusted to obtain just the right amount of tension.

Using the side of the T opposite the pocket-clip, the device enables the use of the scale as a depth gage for measuring depths of holes, for meas-

uring lengths of stock, for scribing lines at specified dimensions, and so on; in fact, the number of uses that can be found for such a tool are practically unlimited.

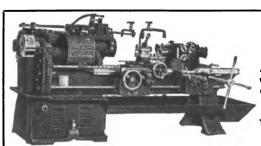
Emergency Tools for Checking Piston Rings

By ELTON STERRETT

EVEN in these days of telegraph and aeroplane deliveries the local machine shop sometimes gets a rush order for some specialty usually secured direct from its manufacturer.

One such unusual demand called for a set of 10.125 x 9/16-in. piston rings—a non-stock size for the manufacturer—the specifications including such requirements as "diametral tension to be 65 pounds, plus or minus 5 pounds" and "plus circularity to be not less than 1/4 in. nor more than % in. at proper gap closure."

Raw material for making these rings was readily obtained from the foundry, blanks being cast separately for better metal quality control than would have been possible if the ring blanks of the cylinder or "pot" type had been used. As there was no means available for hammering the rings to set up the desired tension within the metal, tension was obtained by first turning the ring to a diameter greater than that desired, and then, after removing a section to provide the gap,



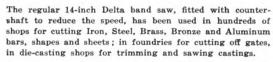
Cincinnati Acme Universal Turret Lathes

A powerful rigid machine for a wide range of accurate bar and chuck work.

Write for Circular

THE ACME MACHINE TOOL COMPANY CINCINNATI, OHIO

NEW - 14 inch" DELTA" Metal-Cutting Band Saw



Here is a new and improved back-geared model which is even more ideal for this work. It is the perfect machine for the general machine shop, toolroom or experimental shop, where many different materials must be cut.

It takes the place of a power hacksaw in cutting off bars and shapes; it is used in the toolroom for sawing off tool, die and fixture stock; it will cut uniform strips from sheets; it saves hours of time in cutting templates and similar tools, and will cut almost any material, such as asbestos, mica, vulcanite, fiber, etc. . . . difficult to cut by ordinary means. Provision is made for four low metal-cutting speeds and one high speed for wood sawing.

Write for special circular giving full details and specifications.

\$**79**⁵⁰

14" Back-geared Metal-Cutting Band Saw, complete with guards, 8" arbor pulley for wood and cone pulley for metal. With one 14-tooth metal-cutting blade. Without light attachment, belts, stand, motor or motor pulley. Shipping weight 175 lbs.

The draw-die segment ring illustrated was impractical to cut on the milling machine because of the diameter of cutter required. It is cut with ease and speed on the Delta band saw. Try your next "awkward" job on one of these versatile tools.



DELTA MANUFACTURING CO. MILWAUKEE, WISCONSIN

closing the ring to the proper measure and turning it to fit.

Due to the size of the ring and the amount of tension desired, holding the ring was difficult, especially when calibration of the tension was attempted across the diameter. In order

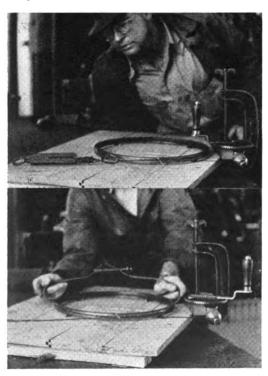


Fig. 1 (Above)—Using a breast drill to compress a large gas engine piston ring so that the tension could be gaged. Fig. 2 (Below)—To cut down the flutter of ring ends in service, the diameter of the ring, closed to provide a gap of the correct width, must be less than that through the properly closed gap. This "plus circularity" varies with the diameter and thickness of the ring.

to calibrate the ring, it was necessary to hold the ring upright on a platform scale, without distortion or restriction, with the gap one-quarter of the circumference from the point of contact of ring and scale, and to apply pressure on the highest point so as to compress the ring and close the gap to the specified measurement for the size of the ring. Finding this method tedious and unsatisfactory, and knowing that circumferential tension is approximately one-third that of diametral tension, use was made of this

> relation to enable a quick and certain check to be made.

> simple but effective squeezing device was made by clamping a breast drill to the edge of an improvised block platform behind prevented sidewise which motion. The drill is shown in Fig. 1. Then, driving a nail in the platform at the opposite corner, and hooking the ring of an ordinary 50pound capacity spring balance to it, a wire was attached to the hook, the wire being long enough to go around the periphery of the ring and leave slack enough reach the compressor mandrel. This mandrel was improvised from a short section of %-in. bolt held in a drill chuck, with the end of the wire bent over and inserted between two chuck jaws. By revolving the large gear of the drill, the mandrel was revolved and the wire wound on it, pulling the wire taut and compressing the ring sufficient to leave a gap of the required width. At this point the pointer on the scale of the spring balance showed the circumferential

tension in the ring to be 23 pounds, which, being one-third of 69, fell within the set limits.

The plus circularity of the rings was determined on the same rig as the tension, with the spring balance omitted. To ascertain this factor in a



SHAFER Co.

The RICKERT

NEW METHOD



To Remove Broken Bolt Ends From Depths without dismantling or expensive delays.

Three easy steps with **Primals** "Lon-GriP" and your broken thresded ends are OUT!





Sets for all sizes of studs and screws and various depths.

Ask your jobber to show you these remarkable troubleshooting tools.



75% of your wrench repairs are stopped when you use propropries with the unconditionally guaranteed housing.



The Ridge Tool Co., Elyria, Ohio

ring it is necessary that it be compressed to proper gap spacing, a which point the diameter as measured through the gap must be greater than that taken at right angles thereto by the amount of excess specified.

For this work ordinary outside calipers were used, the compressor holding the ring firmly without in the least affecting its tendency to assume a form corresponding with the forces acting within itself. The only precaution found advisable in making this check was to see that the gap came as closely as possible to the spot where the tangential portions of wire crossed as they encircled the ring. To insure this and to prevent the ring from possibly binding slightly on the calibrating platform, it was supported on small rollers of 4-in. welding rod, each two inches in length, placed under the ring at points 90 deg. apart. This device enabled the ring to center itself without frictional restraint and thus removed any oblique strain from the wire either at the fixed end or the tightning mandrel.

By using the device described, the shop was able to deliver a set of rings which had the specified qualities, filled the emergency order quickly, and gave all the service which could be desired, with a saving of time amount ing to three days over the shortest time in which the rings could be obtained from the manufacturer of the engine.

Brown & Sharpe Master Feeding Fin-This four-page folder, describing the B & S Master Feeding Finger with interchangeable pads, is now being distributed by Brown & Sharpe Mig. Co., Providence, R. I. The folder describes the No. 22M Master Finger and photographs are included illustrating manner in which the master finger and pads are used. Pads of hardened steel, bronze and cast iron are described and Specifications are given for illustrated. the different sizes of fingers, together with current prices. Copy free upon request.

A BEFORE & AFTER story

that Shows a Saving of 20% to 60%

BEFORE



● The 1" taper shank reamer at the left, costs new \$4.40. The 15/16" recut tool at the right, costs new \$4.00. Reclaiming by the N. T. S. method costs only \$2.00—a saving of \$2.00 (50%).

That's the end of our story but it's only the beginning of your savings. Why not send a trial order and find out for yourself how to save 20% to 60% on your tool costs? We will grind your tools to their original accuracy without destroying the temper and guarantee them to be as good as new.

We pay shipping charges one way.

Write for our 18 page illustrated catalog.

NATIONAL TOOL SALVAGE CO.

DETROIT MICHIGAN

AFTER TO



TOOL SALVAGE IS TOOL ECONOMY

Over the Editor's Desk

The Parable of the New Deal

A Certain Man had a Vineyard in which Labored many Servants, and the Servants Arose Early and Travelled Many Furlongs by Foot in Order that they might Arrive before the Blowing of the Whistle. And in Due Time one of the Servants became weary and Foot-Sore, and He Raised his Voice in Complaint, Saying: I shall Build a Chariot, and the Wheels shall Turn, and the Chariot shall Move Swiftly, and there shall be Neither Ox, nor Ass, nor Horse Before, but it shall carry Oil, and the Oil shall Burn, and the Burning thereof shall cause the Chariot to Move.

And the Servant Labored early and late, and Builded the Chariot, and the Chariot did go Whither he Listed, and the Speed was such that the Driver could Travel many Furlongs, and Complete many Tasks, while yet it was Day.

And the People Marvelled, and Many brought their Gold to the Servant, saying: Build me a Chariot likewise. And the Servant became a Master, and Builded a Shop, and gave Hire to a Neighbor to Help him. And he Considered the Laborer Worthy of his Hire, and he Paid him a Goodly Wage, and the Laborer was Happy, and in Time he also Bought a Chariot.

And the Servant who was now Become a Master hired Another Laborer, and yet Another, and the Orders for Chariots multiplied. And the Master Conserved his Shekels and Builded a Great Factory, where he could Hire Many Workmen to Help him. And his Workmen and their Wives and their Children and their Servants had many Gadgets which they had not Known before, and they were Happy.

But it came to Pass that there arose a Malcontent among the Servants, and this Man did Exhort the Laborers, saying: See ye not that the Master maketh Money and Waxeth Rich while we are yet Servants and Laborers? Come ye, therefore, and Join my Union, and pay me each a Shekel for a Card, that I may know ye are of my Gang, and we will Sit, and Labor not, and we shall Rise Not until the Master hath Recognized our Union, and hath Agreed to give Hire to none except he pay me First a Shekel for a Card, and in due time he shall Pay over to us his Profits.

And while he yet Spake, there were Those among his Fellow-Servants who Demurred and said: How can ye do This? Hath not the Master invented this Chariot, and is he not Entitled to Profit for his Far-Seeing, and for his Stewardship? For know ye not that Others have tried Likewise, and Many are the Would-be Manufacturers that have Fallen by the Wayside?

But the Discontented Servant Prevailed upon them, and they Did Sit at their Jobs and Labored Not, neither would they let Another labor in their Place, nor yet allow the Master to send in Others who needed Jobs. And the Fires died under the Boilers, and the Smoke became Stagnant in the Chimneys, and there were no Chariots for Those who would Buy them.

And so the Master arose and went before the King, and said: O King, my Servants and my Laborers are on a Sit-Down Strike; They Toil not, neither do they Spin, and my Machinery Rusteth, and my Materials Spoileth, and my Tools Rust and Corrode, and my Money goeth for WPA, nor is there any Coming in to Carry on the Business. And the King said: Know ye not that This is a New Deal, and the Laborers may Sit whither they Will, and give Thee the Bronx Cheer, and ye shall Take it and Like it?

And the Master said: O King, This is not only a New Deal; it is also a Raw Deal and without doubt a Mis-Deal, and ye may be Sure that at the Next Deal, the Dealer thereof shall Deal with his Sleeves Rolled Up. Once is Enough!

CO TOOL CO

Bushing Costs 00%

Concentricity 100%

with ALCO Drill Chucks and Tap Holders

These figures do not exaggerate

SINCE no bushings are required, there can be no bushing costs. Your Tool Room will find refreshing the relief from sudden calls for special size bushings for special verk. And there'll be no time lost in looking through cans of bushings for the size

work. And there'll be no time lost in looking through cans or busnings for the size required, even though you know you have it already made up.

With these new ALCO Tools, you can feel confident that there'll be 100% concentricity. They'll do better work for you at a cost per unit lower than you have ever before been able to reach.

Your request in tonight's mail will bring you complete details which you cannot afford not to consider.

ALCO TOOL COMPANY

BRIDGEPORT

PATS. PENDING

CONNECTICUT

New Shop Equipment

Norton 10-In. Type C Automatic Cylindrical Grinder

Norton Company, Worcester, Massachusetts, has developed a specialized, highly productive, wholly automatic arrangement of their well known 10-in.

Norton 10-In. Type C Automatic Cylindrical Grinder

Type C Cylindrical Grinding Machine, designed for plunge-cut grinding operations.

This new machine automatically grinds cylindrical parts concentric with their axes, in large quantities at low cost and with a minimum amount of attention required from the operator. Manual work consists of keeping the machine supplied with work compensating for wheel wear by means of a standard mechanism adjustable to 0.0001 in., and truing the grinding wheel when necessary to maintain the desired fin-

ish. The wheel truing mechanism built into the wheel guard and is h draulically operated.

The automatic grinding cycle includ placing of the work in the holding a driving position, grinding to accur size, releasing the finished piece a

dropping it into a retuchute. Regulation of a time required for the aumatic cycle is by means a hydraulic valve which me adjusted at any time during the operation of machine thus providing degree of flexibility closely approximates the skillful craftsmanship of expert operator on a plimachine.

Safety of operation is important feature of machine which is so signed that at the fall of any mechanism to p form its functions all of mechanisms stop, thus tomatically signalling attention.

The type of headsto footstock and work load fixtures used vary according to the shape and of the work and the griting requirements. A chappe loading fixture is tillustrated arranged grinding steel bushings ternally splined. A hydrically operated set of gers at the bottom of chute picks off one bust to be ground, advance

between the centers of the two live significant descriptions of the synchronized work heads while sin taneously removing the previously grobushing and dropping it into the retchute. The operator keeps the upchute filled and the finished work for the lower chute drops into a convent ly located receptacle.

Nominal capacity of the machim 10 in. diameter and 18 in. length. actual capacity, however, is determi by the work and the design of the v heads and loading mechanism. number of cycles which the machine can perform in a given time is for all practical purposes unlimited. In practice, however, the production rate is determined by the amount of grinding and the degree of finish required.

A grinding wheel 24 in. in diameter and up to 5 in. wide or 20 in diameter up to 7 in wide is employed, driven by a constant speed motor of 10 to 25 h.p. depending on wheel size) mounted directly on the wheel slide. Two other motors are used. The work drive requires a 34 or 1 h.p. constant speed motor and the

motor and the drive for the hydraulic lubricating and coolant pumps 3 h.p.

Landis Type BD Plain Hydraulic Grinder

The 10 and 14in. Type BD Plain Hydraulic Grinder which has been placed on the market by Landis Tool Company, Waynesboro, Pa., is the latest development of this firm for the grinding of relatively long work having small diameter. Tinning rolls, steckel mill shafts and mindles are repreentative jobs. necessary, When the table may be

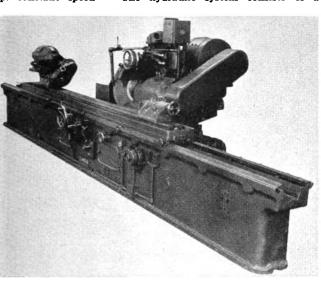
gapped to swing work having projections. This machine supersedes the 10 and 14-in Type B Plain Machine, many of whose features have been retained.

The dynamically-balanced wheel drive motor is mounted on the rear of the wheel base, from which point the drive to the right-hand end of the wheel **spindle** is through multiple V-belts. This design is said to assure full, smooth delivery of power at all times and proide easy and quick belt change. Babbitt-lined steel wheel spindle bearings are used, being flood lubricated con-inuously with filtered oil. The oil pump is driven by a gear on the spindle, thus assuring lubrication from the moment the wheel spindle starts to roate. Sight feed valves at the top of the wheel base enables the operator to

check and regulate the flow of oil.

An all-multiple V-belt work drive is a major feature of the headstock. From the motor to the jackshaft and from the jackshaft to the face plate, the drive is through multiple V-belts. One simple adjustment is provided to maintain the proper tension on both drives. The smoothness of a drive of this type is absolutely essential when the high finish demanded for such work as steckel mill rolls has to be secured.

The hydraulic system consists of a



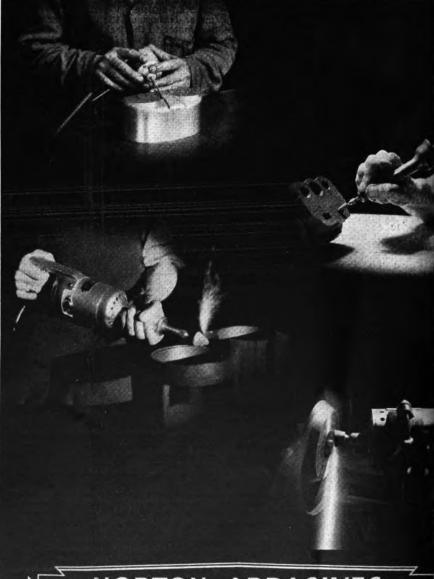
Landis 10 and 14-In. Type BD Plain Hydraulic Grinder

low pressure variable flow pump and a continuous motor. Both are simple in design; all parts run in oil and antifriction bearings are used. The speed range is from 12 to 240 in. per minute. Throughout this range, traversal is said to be smooth and uniform while reversal is accurate and without shock.

The pump drive motor is mounted at the rear of the bed and drives forward through multiple V-belts to the oil pump which is mounted within the bed. The water pump shaft extends through the bed from the other side and is coupled to the end of the oil pump shaft. The water pump, which is of the centrifugal, self-priming type, is compact, its bearings are fully protected from water, and the suction line is cast integral with the body to elimi-

116 MODERN MACHINE SHOP

July, 1937



NORTON ABRASIVES

gitized by GOOGLE

or All Kinds of Jobs n All Types of Hand Grinders

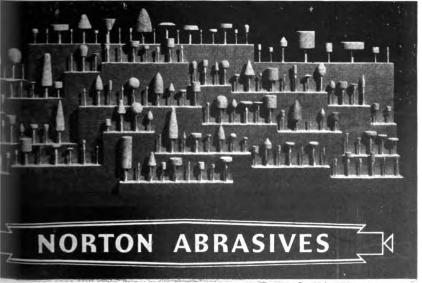
NORTON MOUNTED WHEELS AND MOUNTED POINTS

FIRTY size and shape of mounted wheel and point that you can think offor the rough, heavy duty jobs—for delicate finishing operations—for elecfor the rough, heavy duty jobs—for delicate finishing operations—for elecfor the rough, heavy duty jobs—for delicate finishing operations—for elecfor thick, presented on hard, teugh die steels, cutting fast and free. For grinding
iron, brass, bronze and similar metals, there are points and wheels of sharp
tolon Abrasive. A catalog describing the complete line of Norton spindlented products will be sent on request.

TON COMPANY,

WORCESTER, MASS.

W-598



nate air leaks. If necessary, a D.C. generator for the headstock motor can be mounted on the rear of the bed in such position that it may be driven by multiple V-belts from the water pump shaft.

The Type BD machine is available in four sizes; 10x96 in., 10x120 in., 14x96 in. and 14x120 in. Net weight of the 10x96-in. machine is 17,800 lbs. Three electric motors are required. The work drive motor on the 10-in. machine is 1 h.p., 500 to 2000 r.p.m. adjustable speed; the horsepower of this motor is increased to 1½ on the 14-in. machines. The wheel drive motor is a 15 to 20 h.p., 1150 r.p.m. constant speed unit and the pump drive motor is a 5 h.p. 1150 r.p.m. constant speed motor.

Cincinnati Wet Abrasive Cut-Off Machine

The Cincinnati Electrical Tool Company, Cincinnati, Ohio, has announced a wet abrasive cut-off machine suitable for straight or angle cutting of practically any material encountered in general manufacturing, including steel alloys, non-ferrous metals such as brass, copper, aluminum, as well as fibrous

and plastic materials in various angles and shapes. The wet cut feature is said to not only greatly crease the life of the abrasive cu wheels, but also to produce a cut a minimum of burr and to elimi burning because the coolant is din on the sides of the wheel as wel on the point of contact of the cut

The machine is suitable for mastraight or angle cuts in solids u 2½-in. or tubing up to 3½-in. diamethe same vise being adaptable for various cuts. In cutting angles u 45 deg., however, the maximum cap is 2½-in. Graduations on the make angle-cutting fast and accurs

The material is held in the vis spring tension on the jaws and work is released by the foot lever the cut is completed, leaving the ator's hands free at all times. work is held securely on both sid the cut, thus eliminating the pocramping of work and preventing breakage. The abrasive wheel is no into the work by means of a hand and the arm which carries the abrahel pivots on the pedestal wis counterbalance for easy operation. abrasive cut-off wheel is compiguarded, with the exception of that

STEEL

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Here is steel in every shape and size in carbon and alloy grades—in stock for Immediate Shipment. Whether it is standard shafting or the finest accuracy stock—steinless steel or special flame cut plates, you can get quick delivery from the nearest Ryorson plant. Allied lines such as welding rod, solder, bobbitt and tools are also included. Unusual facilities for cutting, handling and shipping assure accuracy, dependability and speed.

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SELF-LUBRICATING CAST BRONZE BEARING

THE Johnson method of combining Graphite and Bronze provides from 40 to 45% graphite contact with the shaft. This provides an exceptionally large area of graphite without weakening the bearing structure or strength.

The dovetailed grooves are CUT into the bearing surface at a lead of 7 degrees. This holds the graphite permanently in place and provides an alternating bronze and graphite contact with the shaft. The first few revolutions of the shaft imparts a thin layer of graphite to both the shaft and the bearing. This action reduces friction to a minimum.

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leeve Bearing Headquarters

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tion necessary for the actual cutt operation, affording protection to operator.

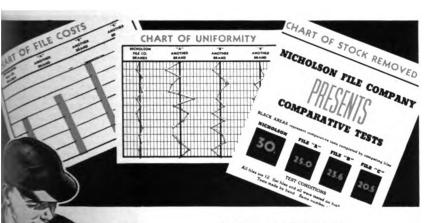
A stop is provided which can be for any depth of cut within the machine's capacity, and a longitudinal is is provided for regulating the length the material to be cut. Two sets wheel flanges in different sizes are finished to ensure the maximum uses the abrasive wheels. A shaft-lockidevice facilitates changing of whee



Cincinnati Wet Abrasive Cut-Off Machine

The coolant system consists of a ¼ h.j direct motor-driven centrifugal pum with 10-gal. tank, piping and conveniently located control valve.

The spindle is of nickel, mounted or sealed-type deep groove ball bearing running in oil. Labyrinth seals are provided to prevent the ingress of grit or dirt into the bearing housings. A conveniently located drain plug facilitate oil renewal. The spindle is driven by multiple V-belts from a 7½ h.p. ball bearing drip-proof motor, 1800 r.p.m. mounted in the pedestal with magnetic starter with overload and no voltage protection and push-button control.



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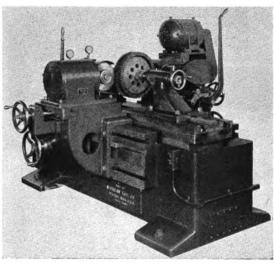
These three leading brands will contribute towards making your own production charts more attractive reading. Put these files to work for you. Always available at your hardware wholesaler's or mill supply dealer's. Nicholson File Co., Providence, R. L.U. S. A.

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A FILE FOR EVERY PURPOSE

Michigan Universal Gear Lapping Machine

A new crossed-axes gear-lapping machine—the Michigan Universal—is announced by Michigan Tool Company, 7171 E. McNicholas Road, Detroit, Mich. The machine is designed for maximum



Michigan University Lapping Machine Set Up For Simultaneously Lapping Both Sides of Herringbone Gear

flexibility where a variety of gears are to be lapped.

It will lap gears ranging from 1½ in. to 20 in. in diameter, and clusters up to 30 in. in length. Change-over time for gears of the same pitch and helix angle is about five minutes, while about 20 minutes is ample for changing over

for gears of entirely different characteristics, involving a change of laps.

The machine is a duplex type, we two laps which may be used either lapping front and back side of teeth at the same time, with the medium running in one direction only, may be set to lap two separate geat

as on a cluster—simult eously. This duplex type operation makes possible reduction in lapping up to 50 per cent, cut handling time in half increasing production proportionately. Thus in dition to being desired ideally for shorter runa variety of gears it is highly efficient as a moroduction machine.

The machine comes equiped with an automatic control mechanism adjusted to permit setting lapping cycle at anythere and the machine running in one direction, then versing, running the slength of time in the of direction and then stop for re-loading.

It will be noted from illustration that the laps are located at el side of the work. The la the back of the machine

the driving member, being di through a 3 h.p., 1140 r.p.m. m The work is mounted either bet centers or on an arbor. The ters are mounted on a reciproca table the stroke of which can be to anything up to 5 in. The tab driven through a second 3 h.p.,



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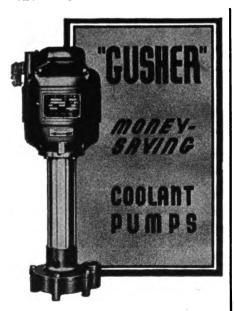
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Solid taps wear down and lose their accuracy—but a Geometric Class SJ Solid Adjustable Tap is restored to size with a simple adjustment. The last unit of a long run is identical with the first. Removable chasers in the Class SJ Tap are easily resharpened—for longer life and cleaner cutting. A single tool will cut a wide range of sizes, requiring only a separate set of inexpensive chasers for each size. Eleven tools are carried in stock to cut from 1 5/16" to $8\frac{1}{2}$ ", with larger sizes to order.

Catalog will be sent on request. Send blue print or sample for definite recommendations on your tapping problems.

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r.p.m. motor. The work itself drives second lap at the front of the mach which lap in turn is provided with adjustable hydraulic brake for esilishing the correct lapping pressure tween laps and gear teeth.

The mounting of the laps is such they may be set at varying angles the axis of the gear being lap (crossed-axes lapping). Further, t lapping heads are mounted on slider that they may be moved to any p tion desired. Lapping two gears of



Closeup of Michigan Universal Lapper Shing How Both Front and Back Tooth Facet a Gear may be Lapped Without Revers the Machine

ferent diameters simultaneously is the made possible in a simple manner.

Primary adjustment for position the laps is through handwheels a screws. For unloading and after loading a hand lever throws the fre



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lap out of engagement and returns it into proper position, the lap head being brought up against for accurate restops locating. Thus the driving lap is left at proper center distance, facilitating re-loading since the driving lap and gear to be lapped will be cormeshed during rectly loading. The front lap then will come back into mesh with the new gear exactly as it was taken out of mesh with the gear just removed. The machine is equipped with suitable pick - off change gears to obtain any lap speed or table reciprocating speed that may be required.

G & L High Speed Cross Traveling Head Type Hydraulic Feed Grinder

The illustration shows a hydraulic feed surface grinder of the high speed cross traveling head type

which has been developed by Gallmeyer & Livingston Co., 308 Straight Ave., S. W., Grand Rapids, Mich. illustrated is built machine with table having 16x48-in. working but other widths and lengths The are available. table speed can be varied indefinitely from practically nothing up to a maximum of 100 ft. per minute, when the machine is driven by a 60 cycle motor. The starting and stopping of the table and the control of



Gallmeyer & Livingston High Speed Cross Traveling Head 'Hydraulic Feed Surface Grinder

speed in this infinite variation is means of the lever in the center of front valve plate, which operates in proximately a 90 deg. arc between stopped position and full speed.

The base of the machine is a her rugged one-piece casting of twice length of the working surface of table so that the table never overhathe base. The upright column what carries the vertical sliding head is one-piece casting of exceptional rigid

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the Control Turnet Lather are built in five sizes—24, 36, 42, as 64. Two heads, main and side head, cutting simultaneous ware much lest time between cuts. The main head turnet as less that of tooling, and is quickly indexed for successions. The side head accommodates four tool bits and the between the side head accommodates.

waters cambined with methodical operation and use of



HE BULLARD COMPANY

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keyed, bolted and doweled to the base member. Maximum stiffness is obtained

by thick ribs properly designed.

The cross traveling spindle slide has a movement equivalent to the working surface of either 16 or 18 in. 4-in. standard width of wheel overruns the working surface 2 in. on both the front and back edges of the table. The cross traveling movement normally operates at each reversal of the table and the amount of movement can be set at any amount from less than 1/32 in. up to 2 in. for each reciprocation of the table. The amount of cross travel is controlled by a small handwheel in the valve plate. By disconnecting the wheel, which can be done instantly, the head can be cross traveled by hand. When can be cross traveled by hand. it is desired to dress the wheel, the lever which normally controls the table movement can be thrown to left of center where it will operate the cross movement in a continuous manner in any desired speed. Spindle construction is of a special ball bearing flanged type with an adjustable amount of pre-load. The spindle is of heat treated special alloy steel and of extremely generous dimensions. The standard spindle drive is by means of a 1150 r.p.m., 25 h.p. motor which drives the spindle directly

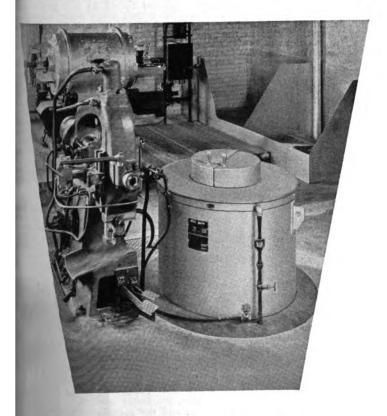
through a splined end; thus the traveling mechanism is relieved of c ing the weight of the motor. and 18-in. machines are regularly eq ped with a 20-in. diameter grin wheel with 4-in. face, but other can be furnished upon special o The capacity of the full 20-in. dian wheel is 17 in. Additional ver capacity can be provided if require

Power elevation of the vertically i ing head slide is provided as stan equipment, operated by a ½ h.p. n which is controlled by a double t switch at the right of the central When the switch handle is the head travels up and when the st handle is down, the head travels of When hand pressure on the switt released, it automatically throws to tral position. Vertical movement of wheel head, in actual grinding open is controlled by the large handwhe the front of the base.

A coolant system for providing adequate flow of coolant is star equipment. The coolant tank is tioned in the corner formed by the of the base and the upright colum the left side of the machine, but separate portable unit on a roller to facilitate removal for cleaning.



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In the development of commercially practical die casting machines for brass, Madison-Kipp has not only written a new chapter in die casting history, but has added prestige to their national reputation in the industry. For the metal holding unit in this historic development Hevi Duty Electric Pot Furnaces are used.

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coolant pump is operated by an independent motor

The hydraulic oil supply tank is mounted in the base of the machine with convenient access for filling, draining and checking the oil supply. The hydraulic pressure is continuously registered by a pressure gage in the main valve plate to the right of center. Convenient access to the hydraulic mechanism is provided. Automatic forced feed lubrication of the table ways is provided from the pressure line and the return lubricant is filtered. All other points requiring lubrication are provided for by means of a Bijur one-shot system. One push on the handle provides sufficient lubrication for a full day's operation. All operating controls are at the center of the base, easily accessible to the operator's position.

No. 2U Reed-Prentice Universal Milling Machine

The illustration shows the No. 2U Reed-Prentice Universal Milling Machine which has been brought out by Reed-Prentice Corporation, Worcester, Mass. The machine is particularly adapted for

general tool and die work. The versal self-contained motor driver facilitates milling, drilling and at all angles. Any angle can tained up to 60 deg. parallel with cross feed from center toward turns and any angle 30 deg. from toward the front of the machine spindle is heat treated and grounds machined to take a No. 2 Moon or No. 7 B & Staper. The treated with a special chromitudess, giving it a surface harding point below the hardness of a degree of the surface of the surface of the surface harding t

The entire machine is rugged being designed to preclude the bility of vibration. All castings a high percentage of steel. A suguard in the top of the knee the cross feel screw from chips front and a heavy leather curtain vided at the rear. The saddle the full length of the table, for rigid table support. The saddle curely gibbed to the knee. All are supplied with ball thrust be insuring ease of operation of the saddle and table. The longitudin screw nut is adjustable for weather the company of the saddle and table and table the screw are chrome molybdenus with nuts made from special

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Here's another rugged and well-balanced Canedy-Otto Drill—precision built from the ground up to give fast, accurate drilling. Vertical Motor Drive provides simplified construction. Driving units are completely equipped with Timken Roller Bearings, the motor and motor cone pulley with ball bearings, and the spindle cone with roller bearings.

Drills are equipped with push button control and magnetic switch. Desired belt tension is easily obtained with convenient, simple arrangement. Self feed is accurate and powerful. Four changes of feed can be had while drill is operating. Capacity for $\frac{7}{8}$ " drills without back gear— $\frac{11}{4}$ " with back gear.

Furnished in single, two, three and four spindle type -15%" center distance of spindles.

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result of the widespread success of the Cyclone Furnace in commercial operations, Lindberg tended this superior heating principle to a convenient size working unit, ideally adapted sting purposes and for tempering small tools and special parts. The Laboratory Cyclone mical in operation to the production Cyclone Furnace, and it gives the same precision rethe work chamber measures eight inches in diameter by ten inches deep, and is prowith a plug type cover which is easily lifted off for inserting the charge. The electric defents are mounted in a separate chamber, thereby eliminating direct radiation to the Powerful air circulation assures rapid, uniform heating.

are type Cyclone meets all modern requirements as carate and inexpensive pilot furnace for checking up reduction, predetermining response to specified heat tents and for laboratory investigation work—as well as ting individual steel parts.



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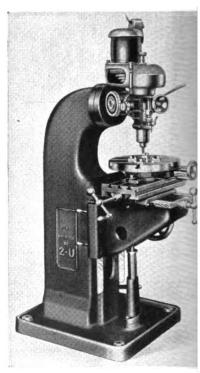
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ADDRESS

leaded phosphor bronze.

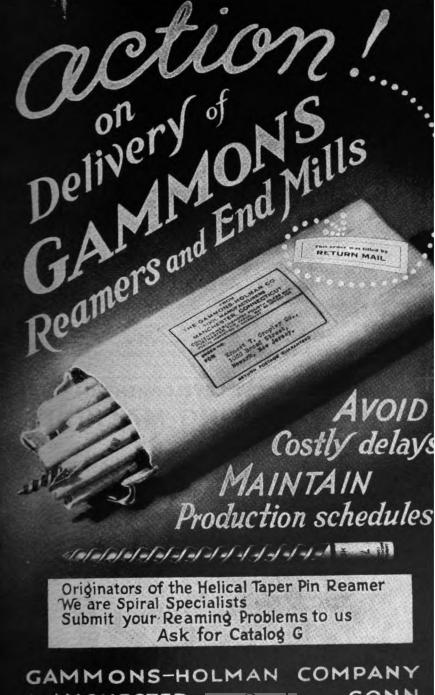
The circular table is 15 in. in d eter, accurately graduated to 360 with an index pointer and is sup with four %-in. T-slots. Operatio by handwheel and double worm worm gear of proper pitch for the gi est variety of work. The worm cal disengaged, making it possible to re the table freely by hand. Where sired, universal or independent ch can be fitted to the table or direc



No. 2U. Reed-Prentice Universal Milli Machine

the rotary base.

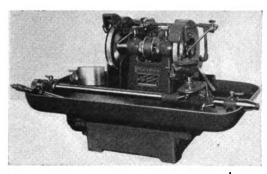
The table is 201/4 x8% in. Length carriage, 161/2 in. Diameter of worl surface of rotary table, 15 in. Long dinal feed, 16 in; cross feed, 11 in. tical feed of knee, 15 in. machine, 5 ft. Floor space requi 40x34 in. Weight of machine with rotary table, net, approximately 1 lbs. Rotary table, 75 pounds,



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Agathon Type 150 Grinding and Lapping Machine

Russell, Holbrook & Henderson, Inc., 99 Hudson St., New York, N. Y., are now



Agathen Type 150 Grinding and Lapping Machine

marketing the Agathon Type 150 Grinding and Lapping Machine which has been designed especially for the correct and safe grinding and lapping of cemented carbide tipped tools. Inasmuch as the grinding and lapping of cemented

carbide requires a machine of the utmo precision, running without vibratio this machine has been developed wit these requirements in mind, not on in the spindle and bearing construction

but also in the method of sur porting the work and transferring from roughing to fix ishing wheels.

The machine is of sturd

construction, the frame con prising an ample sump ar tray intended for mounting o a bench or suitable pedesta The motor bracket is so cor structed as to provide mear for adjusting the belt tension. The pump is driven from the motor pulley. Vibrationless of eration is insured by the stability of the wheelhead and th glass hard nitralloy spindl which is carried in bearings (high grade phosphor bronz The arrangement of the bear

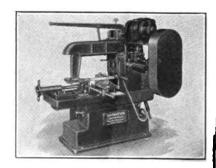
ings and felt seals provides for reliabl protection against the intrusion of du or coolant. The spindle pulley is locate between the bearings.

While any type of grinding wheel mabe used, diamond wheels are preferred

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Swivels on base for anaular cuts—three speeds by V-belt—saw guide of parallel type—saw frame has 4 large, self-aligning shoes, unaffected by excessive tightening of saw blade-vise graduated to 45°—feed is compensating type.



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And cost steel construction in motors is nothing new, nothing experimental with Allis-Chalmers. We have always recognized the value of cost steel parts in motor construction, because of their

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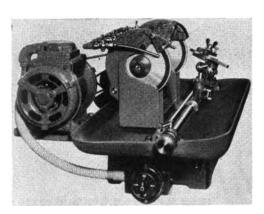
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747.A



136



Side View of Machine Showing Operating Mechanism

These are furnished in two grades; one for rough grinding and the other for finish grinding or lapping. Each wheel has a working surface on each side. The rim width of each wheel is 0.40 in. on a diameter of 6 in., and a diamond depth on each side of 0.160 in. for the roughing and 0.080 in. on the finishing

wheel. For cutting off or parting of cemented carbides, a suitable thin diamond wheel is supplied. Where aluminous abrasive wheels are used, the wheel is of the double cap shape, of corresponding dimensions.

The compound angle toolrest can be angularly adjusted in all directions, and clear reading scales provided for setting. grinding is done by rocking the toolrest on the bar, clearing the rim at each movement. The bar. which is hardened and ground, is furnished with a fine micrometer feed so that final feeds of very light proportion can be taken. By releasing the tool clasp and holding the tool lightly against the ground surface of the toolrest, a free-hand action may be obtained, if desired, but preserving absolutely both the form and

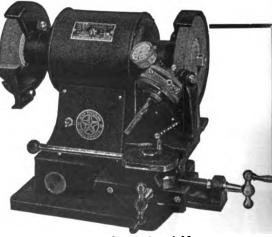
relief angles.

Inasmuch as the toolrest slides on a hardened and ground bar, the work can be transferred from the roughing to the finishing wheel without disturbing the setting. An opposed angle can be ground by changing the setting and repeating the above process on the oppo-

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site sides of both wheels, thus preserving the distinct advantage of always grinding down on the work without reversing

the rotation of the wheel.

A toolrest, supplied as standard equipment with the machine, will take a shank up to ½ in. square, and a larger toolrest, taking up to 1½ in. square, can be supplied on request. A flat inclinable table, interchangeable with the toolrest is provided as standard equipment.

The machine takes a standard ½ h.p., 1725 r.p.m. motor with a shaft expansion of ¾-in. diameter and 3/16 x 3/32-in. keyway. A machined pad is provided

for the switch.

American Type PD Hydraulic Broaching Machine

Designed especially for fast, accurate internal broaching, the American Type PD Hydraulic Broaching Machine, now being built by American Broach & Machine Company, Ann Arbor, Mich., is simple in construction, easily set up, and can be operated at high speed with safety. Certain distinctive features of American design and construction are said to make the machine unusually

compact, durable, easy to operate a economical.

The ram, hydraulic cylinder, and accrately machined slide ways are cast tegral, a feature which is said to prove a long stroke with a relatively low cumn height which brings the work sport to a position most convenient easy work-handling. The hydraulic inder has a highly accurate and fit finished bore to which the piston closely fitted, thus insuring most cient application of power to the brustmooth cutting, and uniformly rareturn.

The long slide ways of the ram cy der casting bear upon bars of hards and ground steel carefully fitted solidly secured to the rigid frame at front and on both sides. Similar form caps at the rear of the bearing that the slide ways are entirely rounded by hardened and ground sthroughout their entire travel.

Completely submerged in oil in separate compartment of the base, highly efficient Sundstrand Hydrs Unit supplies uniform oil flow at cor pressures and in suitable volume for smooth, powerful cutting stroke rapid return. The hydraulic circuit



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3 sizes of Geared Motorpumps — Nos. 101-102-103.

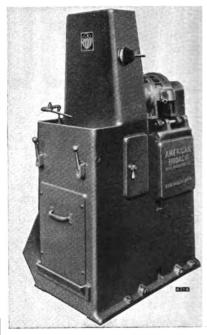
2 sizes of Centrifugal Motor-pumps —Nos.204-210.

May we send data, performance, etc.?



Brown & Sharpe Pumps cludes an adjustable safety valve, has minimum of connections, and is procisely controlled by a four-way valve.

The American Automatic Broach Puler, convenient loading height, and safed controls make for rapid and safe operation of the machine. After placing work-piece on the pressure plate with the broach through the work and locked in the pulling head, the operator place his right hand on the operating level.



American Type PD Hydraulic Broaching Machine

and his left on the safety lever. Bot levers must be pressed at the same tim to operate the machine. The machine is readily changed from one type of jot o another simply by substituting suitable broach guide and broach. Strok length is easily adjusted. A fan-typ gage indicates pressure in the hydrauli circuit.

Automatic pressure lubrication is provided for the ram slide ways, also fo all of the other bearings in the machine A copious supply of clean coolant is pumped to the work from a reservoir in the base of the machine, which is separated from the chip compartment by i

FARREL HYDRAULIC PRESSES

for Accurate, Economical Metal Forming

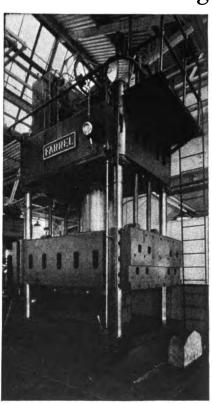
flydraulic power as applied and controlled in Farrel Hydraulic Presses provides the simplest, smoothest and most adaptable force for exerting uniform pressures with maximum accuracy in metal forming.

Readily adjustable control permits a vide range of pressures, providing a high degree of flexibility and selectivity in the pressures required for different operations and different metals.

The smooth, even application of fluid power reduces metal tearing and spring-back to a minimum. There are fewer press-overs and rejects. Life of dies is prolonged. Less time is lost in subsequent assembly operations.

Farrel Hydraulic Mctal Forming Presses are designed for high speed, automatic or semi-automatic operation, with uniform pressure on every piece and an exact visible indication of what that pressure is. Their design and construction make possible continuous high output at low operating and maintenance cost.

Our Bulletin No. 263 describes in detail the advantages of the hydraulic press for metal forming. Your copy will be sent on request.



Farrel Hydraulic Metal Forming Press with self-contained oil power unit mounted en top of the press. 500 tons maximum capacity, stroke and opening adjustable up to 36" and 60", respectively. Platen area 80"x126", with provision for future extension.

FARREL - BIRMINGHAM
COMPANY, INC.

44 Main St., Ansonia, Conn.

142

series of baffle plates.

Power is transmitted direct to the shaft of the hydraulic unit through multiple V-belts operating from a standard 5 h.p., 1800 r.p.m. motor. The motor is mounted behind the column on an adjustable leaf supported by the housing of the hydraulic equipment. The entire drive to the hydraulic unit and coolant pump is completely enclosed by a substantial guard.

The capacity of the machine is four tons. The maximum stroke is 22 in. The cutting speed per minute is 30 ft. and the return speed is 40 ft. Size of



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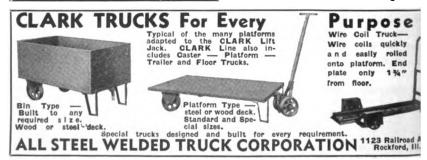


View of American Automatic Broach Pul Extreme Lower Position

work plate, 7x12 in. Height of plate from floor, 29 in. Oil rese capacity, 35 gal. Coolant pump cap per minute, 7 gal. Floor space requ 2½x4 ft. Height overall, 6 ft. We net, including motor, 2500 pounds.

Rockford Double-Housing Hv-Draulic Planer

Designed for heavy duty, the Dot Housing Hy-Draulic Planer shown in illustration—product of Rockford chine Tool Co., Rockford, Ill.—has n important features which are interestoreduce costs, increase production improve quality on a variety of wor To eliminate the disadvantages in



to produce threads of materially greater accuracy, at production costs which compare favorably with less accurate methods now in common use: this was Ex-Cell-O's objective in is years of developing and perfecting the bx-Cell-O Precision Thread Grinders. Now it is possible to grind from solid hardened blanks and to hold lead error to .0002" per inch. Use of the wet arinding method and long-life 18" wheels makes for extreme accuracy and grind-

An important feature of these Precision Thread Grinders is their flexibility, their adaptability to a wide range of work including either right or left-hand threads on screws, taps, chasers, or worms, both as gauges and production parts. Complete information will be mailed upon request.



Drill Jig Bushings Grinding Spindles

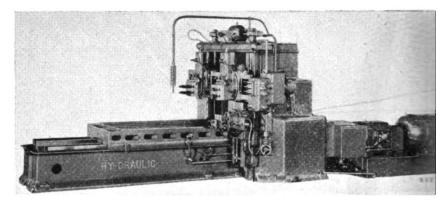
Counterbores & Broaches Carbide Tool Grinders

ing wheel economy.

Precision Boring Machines Precision Thread Grinders

Hydraulic Power Units XIO Carboloy Tipped Tools

EX-CELL-O CORPORATION, DETROIT, MICHIGAN Please send literature on Ex-Cell-O Products as indicated.



Rockford Double-Housing Hy-Draulic Planer

ent in the use of a reversing electric. motor, the Hy-Draulic Planer employs a standard constant speed motor, with relatively simple controls, for driving the With this drive the hydraulic unit. cutting speed of the table reaches the selected rate almost instantly and remains constant throughout the entire cutting stroke. Reversals of the table movement are quick and smooth. Cutting speeds are independent of return speeds and both have infinite adjustment between high and low limits. There is no mechanical connection between the motor and the table, and it is said that the hydraulic drive increases the life of the cutting tools 50 per cent between grindings.

The table can be stopped, inched, or reversed at any point in its travel. The few fast-moving parts which are subject to wear are submerged in oil or pressure lubricated. The cross feed to the heads is also hydraulic.

Push button control is provided for

the direction of rapid traverse for heads, elevation or lowering of master motor switch and instant st ping of the machine, the push butt being located in a pendant suspend over the machine table. Power elevat of the rail operates in conjunction w the automatic hydraulic rail clamp. cross rail is supported on massive c umns which are accurately keyed, do elled and solidly secured to the b Power rapid traverse to all heads in directions is provided by a direct co The hydraulic cont nected motor. panel is completely enclosed but read accessible. Bed ways are lubricated twice-filtered oil under pressure from The modern one-sl powerful group. The modern one-s pressure lubrication system is used rail heads, side heads and feed units.

The main driving motor is direct of nected to the hydraulic power unit, be being mounted on a heavy base solk secured in position. Duplicate contrare provided for the table movement a

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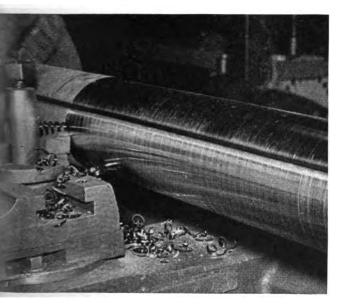
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VASCOLOY-RAMET

BLANKS Vascoley-Ramet is available in three forms, (a) com-pletely finished tools, (b) milled and brazed tools, and (e) blanks. V-R blanks are furnished in 5 standard styles and in sizes to meet every requirement. To nake tools with V-R blanks is a V-R simple operation, fully described in a new instruction booklet, available free — upon request.

rong a slotted bar of heat treated Chrome Vanadium Steel, quenched and drawn to Bronell, using a Vascoloy-Ramet tip, grade EE, braxed on a Silman steel shank nous milling a recess.

Vascoloy-Ramet	Feet Per Min.	Feed	Depth
Grade EE	150	.032"	1/16 to 3/32"

rmittent cutting — a hard alloy el shaft, 364 Brinell, with a % h slot — striking the cutting tool times a minute!

perts said no tool material would rate under such conditions.

Vascoloy-Ramet, grade EE, ned the shaft with precision and shed with the cutting edge unaged. Further, this tool was ped without milling a recess, the R blank being brazed with Tobin ase on a shank of Silman tool

Vascoloy-Ramet is produced in 17 standard grades, of different tantalum carbide content, strength and hardness, to cover the entire range of machinable materials and machining needs.

Today, great industrial plants and small machine shops, as well, are finding "a grade for every use" the secret of faster production, more pieces per grind and lower operating costs.

VANADIUM ALLOYS STEEL CO. SALES OFFICES Vascoloy-Ramet Division North Chicago, Ill.

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.The TANTALUM CARBIDE TOOL MATERIAL ...



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adjustment of rail heads. Three levers provide complete control for power operated movement of both rail heads including feed or rapid traverse, right or left, up or down, separately or in unison, and the side heads have similar con-Electrically operated hydraulic rail clamps are provided. Pressir button on the pendant releases Pressing a the clamps and automatically raises or lowers the rail. Releasing the button stops the rail and automatically clamps securely in position. Hydraulic tool lifters, smooth in action, do not tend to jar tool slides out of adjustment.

The size of the machine is 48x48 in. The standard lengths of the table are 9, 11, 13, 15, 17 and 19 ft. and the lengths of the stroke are one foot less in each instance. The table is 44 in. wide. Maximum distance of table to rail, 48½ in. Maximum travel of left hand or right hand rail head, 55 in. Maximum vertical travel of rail head tool, 12 in. The horizontal feed can be regulated to any desired amount from 0.024 in. to 0.500 in. and the vertical feed can be adjusted to any desired amount from 0.010 in. to 0.250 in. Horizontal adjustment of side head, 11 inches.

For heavy duty, the table cutting

speed can be regulated to any desi rate from 0 to 40 ft. per minute the return speed to any rate from 10 150 ft. per minute. The maximum ts pull is 30,000 lbs. For medium di the table cutting speed can be set fi 0 to 50 ft. per minute and the ret speed from 10 to 150 ft. per min Maximum table pull, 24,000 lbs. light duty, the table cutting speed be set from 0 to 80 ft. per minute a the return speed from 10 to 150 ft. Maximum table pull, 15. Approximate net weight of 10 electrical machine. less equipme 54.000 lbs. Approximate net weight each additional two feet of table, 4 The electrical equipment (suppl or ordered by customer) includes a h.p., 900 r.p.m. master motor, 2 h 1050 r.p.m. rail elevation motor, 1 h 1050 r.p.m. traverse motor, and spec pendant hydraulic planer control.

Ames Enclosed Head Precision Bench Lathe No. EH3

A modern design of the popular p cision bench lathe in which increas power for heavier cuts, higher spine speeds through direct motor drive, fu enclosed driving belts, and the maximum



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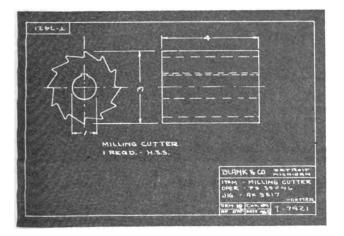
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Just some teeth around a[blank



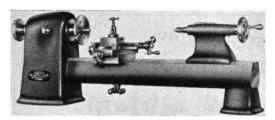
That to some people is a milling cutter and is comparable to designing an automobile by putting four wheels on a box.

For maximum efficiency, milling cutters must be engineered.

Let us study your problems.

GODDARD & GODDARD CO.

Milling Cutter Engineers DETROIT, MICH.



Ames Enclosed Head Precision Bench Lathe No. EH3

of accuracy are combined has been placed on the market by B. C. Ames Co., Waltham, Massachusetts.

Among the qualities inherent in the design of this lathe are a true-turning spindle, wide range of spindle speeds, perfect center alignment, a true bed, and accurate compound slide rest. The lathe is easy to set up for short jobs, starts and stops quickly, has a secontained motor drive, and is easny moved around the shop.

The outstanding feature of the lathe is the Transitorq drive—an exceptionally compact unit that provides an infinite variety of speed changes by means of a handwheel control. Using a ½ h.p.

A.C. or D.C. motor, spin speeds from 200 to 2000 r.] are obtainable, or other obinations according to diseters of pulleys used. The land Transitorq are conner by twin V-belts which tightened by lowering Transitorq. No adjustment the Transitorq are ever quired. The lathe and Tratorq are mounted on an ary shop bench or on a cially constructed bench ing steel legs and a wood top.

The detachable headstock is all feature of this lathe. The headstor fully enclosed, has double V-belt of preloaded super precision ball bear hardened and ground alloy steel spilocking pin conveniently located on front side, ball thrust for draw spindle, and is accurately hand-sor to fit the bed. The entire head assembly can be taken apart and

together again in a few minutes.

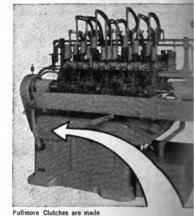
The bed is cored to reduce we webbed for strength, has a T-sit hold attachments and is accur hand-scraped. The bottom surface machined so that the bed is held

PULLMORE CLUTCHES Used

Hydraulic Lapping Machines

The A. P. Schraner Company use No. 3 Single-type Pullmore Clutches, running in oil, in their Improved Model B Hydraulic Lapping Machines. These machines are used for high-production work, every unit in their construction must be absolutely reliable and operate continuously with a minimum of attention. Pullmore Clutches have proved highly satisfactory in these machines because they are reliable, efficient, durable; easily adjusted when this eventually becomes necessary.

New Booklet—Contains complete information on sizes, dimensions and capacities of Pullmore Clutches; drawings of typical applications; twenty illustrations of equipment using Pullmore Clutches; brief information on Rockford O-C Toggle Type and Spring-Loaded Clutches. Engineers, designers, purchasing agents and others responsible for reliable, efficient, low cost power transmission and control are invited to write for a free copy.



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on the bench by two bolts. The and the larges its kind available. Bars of stock inch in diameter can be inserted that the headstock spindle. The unus large swing over the bed permits use of large diameter jaw chucks face plates. The bed is 36 in. long a maximum center distance of 17½ The swing over the bed is 83% in. stock spindle travel, 3½ in.; comperest top slide travel, 5½ in.; comperest bottom slide travel, 3¾ in. compound rest swivels 50 deg. e side of center. The net weight of lathe with regular equipment is 120 and the net weight of the Trans drive unit is 85 pounds.

Regular equipment includes the with hold-down bolt, nut and was enclosed headstock with preloaded bearing spindle and double V-drawback spindle and handwheel; collet; 4½ in. dog drive plate and ter, and tailstock and center. Transitory drive unit includes a ½ A.C. or D.C. motor, switch and managed control, wired and connected

ready use.

DeVilbiss Air Compressing O

Four air compressing outfits, sur in 71/2 or 10 h.p. with single or stage compressors available with horsepower, have been placed on market by The DeVilbiss Company These Phillips Ave., Toledo, Ohio. pressors are designed especially for automotive service stations and aut finishing establishments, whose pressed air requirements are unu heavy, and for small industrial whose compressed air needs are b the capacity of the ordinary air-c compressor but not equal to the c ity of the industrial type water-c air compressing outfit.

Two compressors, each of which compressors are two stage compressors of lbs. with the single-stage unit, are mounted on opposite ends of the fo-in, air tank. The motor which both compressors is set between

on the air tank.

Each compressor has a V-belt combination air strainer and meheck valve, inter and after cooler centrifugal pressure release mech set to cut in at 160 lbs. and cu at 200 lbs. on the two-stage, and 80 lbs. and out at 100 lbs. on the s stage compressor. Displacement of



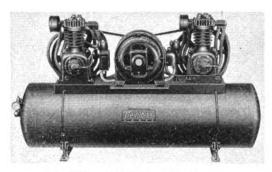
● Far-sighted manufacturers... such as INTERNATIONAL BUSINESS MACHINES CORPORATION... are quick to sense the advantages of automatic lubrication. On the International machine, the Bijur Lubricator serves 90 bearings... helps to keep the machine at full operating efficiency. Again—in their production departments—they find it advantageous to use machines on which Bijur Lubricators are standard equipment. Write for Bijur Bulletin "D."

BUUR LUBRICATING CORPORATION

LONG ISLAND CITY, NEW YORK

outfits varies from 31½ to 57 cu. ft. of free air per minute, depending upon pressure and horsepower.

The air tank capacity of both the 7% and 10 h.p. outfits is 10.88 cu. ft.,



DeVilbiss Air Compressing Outfit

although a 20x72-in, tank with an air capacity of 13.06 cu. ft. can be supplied if desired. Standard equipment on all outfits includes pressure gage, outlet, drain and safety valves, and automatic starting device.

COUNTER-

BORES

Red Stripe Compound Angle Magnetic Chuck

The Grinding Machinery Co., 2832 Grand Blvd., Detroit, Mich., has

nounced a compound a magnetic chuck for use in grinding of tungsten carl tools, crankshaft tools, la tools, thread chasers, and The chuck is made two sizes indicated as Senior and Junior models. Senior Model is 41/2x6 in. V-block and vise attachme to fit the same base. block is 4x4x3 in., and is hi ened and ground all over.

The Junior Model is 31/4: in., with V-block and vise fit the same base. The V-b dimensions being 3x21/2x21/ This block is also hardened

SPECIA

TOOLS

ground all over.

A portable rectifier operates on 110 volt D.C. current is nished for both chucks if needed. I able rectifiers are now available for in plants where it is necessary to tr fer the magnetic chuck from one tion to another in the plant where



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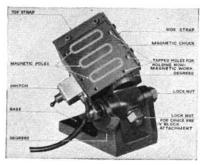
THROUGH use of abrasive wheels speedbonded with Bakelite Resinoid, makers of special tool-steel alloys increase production in cut-off operations, with consisten' safety to workers and fewer shut-downs for wheel-dressing. Strong, heat-resistant, coolrunning...Bakelite Resinoid bonded wheels operate safely and efficiently up to 16,000 s.f.p.m. Write for informative booklet 47G, "High Speed Abrasive Wheels".

BAKELITE CORPORATION, 247 PARK AVENUE, NEW YORK, N.Y.



rect current is not available.

The Electro-Rectifier uses standard radio tubes and furnishes an economical means of obtaining direct current from



Red Stripe Compound Angle Magnetic Chuck

standard 115 volt, 50 or 60 cycle lines. The rectifier comes complete with a suitable cord and outlet plug. A female Hubble cap is also provided so that the chuck may be plugged directly into the direct current output of this rectifier. An on-and-off switch is mounted on the front panel of the rugged metal housing containing the transformer and

rectifying tubes. A pilot light is i vided to notify the operator that tube fatigue has accrued and the cl is no longer magnetized.

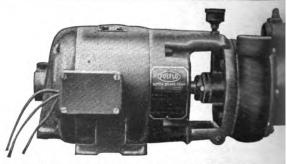
The use of standard radio tubes meaning possible economical replacements mediately in the most remote comunities. These tubes have an expant life of 1000 hours when used this rectifier. The engineering dependent of this company is available information regarding the best typerectifier to use with a specific to and where necessary will design specifically installations to meet special needs.

Covel No. 72-A Swivel Head Surface Grinder

Covel Manufacturing Company, I ton Harbor, Mich., has develope swivel table intended for use in grinding of all kinds of milling cu including spirals, counterbores, sp tools and irregular surfaces. The I grinding wheel is mounted on a h spindle driven by a 1½ h.p., 1750 r. motor. Power is transmitted by m of a V-belt and three speeds are a able. The spindle runs in ball bear which are designed to prevent end.



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AG5M	H.P.	BALL	BEARING	MOTOR	50	G.P.M10	FT.	HE
AG6M3/4	H.P.	BALL	BEARING	MOTOR	70	G.P.M10	FT.	HE

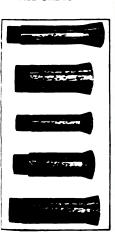
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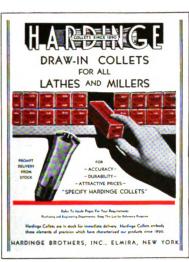
COLLETS



—IMMEDIATE SHIPMENT FROM STOCK— ASK FOR BULLETIN No. 36A

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ALL TYPES



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- 3. Gives normal round, hexagon and square capacity of standard collets.
- 4. Shows how all of your lathes and millers may be adapted for collets.
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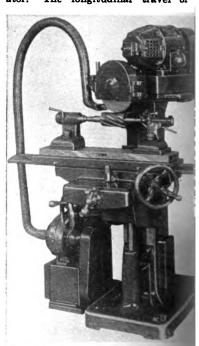
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The head swivels 30 deg. in either dirtion and the motor is mounted on vibration-absorbing base which swit with the head.

Centers of fixtures can be moun on the swivel table. The table is gruated at one end in degrees and at other in inches-per-foot taper. rests for indexing can be fastened the head or table. All adjustments accurate and convenient to the or ator. The longitudinal travel of



Covel No. 72-A Swivel Head Surface Gr

table is through a spiral gear (mou on a ball and roller bearing) and I This adjustment is smooth and fast, is always under full control of the cator.

The size of the standard grin wheel is 10-in. diameter by 3/4 in. t by 21/2-in. hole. Wheels up to 21/4 thick can be supplied. The main s die speeds are 1900 r.p.m., 2400 r. and 2900 r.p.m. Longitudinal traw table, 18 in. Vertical movement table, 11 in. Transverse movemen table, 71/2 in. Working surface of st

table, 6x20% in. Table swivels 45 deg. in either direction.

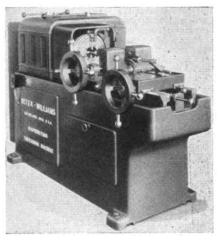
Centers will swing work 12%-in. diameter by 14½ in. long. Distance from center of grinding wheel to table, maximum 17½ in., minimum 6½ in. Height from center of spindle to floor, 49½ inches.

Ploor space required, 5x4 ft. Weight with motor, without dust collecting at-

tachment, crated, 1330 pounds.

Oster No. 915 Single Spindle "Rapiduction" Bolt Threading Machine

The Oster Manufacturing Company, Circuland, Ohio, has announced the swiopment of an improved No. 915 Single Spindle "Rapiduction" Bolt Threading Machine. The machine is built for high production on standard runs in bolt plants and for increased production on an extremely wide variety of special work, a necessary part of the manufacturer's product. Its regular bolt range covers all sizes from %-in. to 1½-in. at spindle speeds ranging from 49 to 298 r.p.m. A spindle bore of 2½-in. and a vise adaptable to many different types of work holders, gives the



Oster No. 915 Single Spindle "Rapiduction" Bolt Threading Machine

No. 915 unlimited possibilities for work of a special nature.

The machine is of modern design. Timken bearings are used throughout



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Compact and rugged, extensively used wherever motors are to be reversed, or speed is to be changed. These controllers can be readily adapted to a variety of special switching combinations. We invite inquiries for special controllers.

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FURNAS ELECTRIC CO. 815 S. 72nd St. West Allis, Wis.

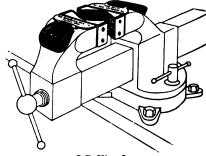
and the diehead is made of the finest hardened and ground tool steel. All the dies are of high speed steel. The spindle is made of high carbon steel forgings, heat treated and ground, and is mounted on pre-loaded tapered roller bearings that are adjustable for long wear. Driving and change speed gears are chrome nickel steel, heat-treated and ground, and run in oil.

The headstock shaft is also made from high carbon steel, heat-treated and ground, and is mounted in tapered bearings, automatically lubricated and adjustable for wear. Semi-steel makes up the vise-carriage. The carriage is rigidly supported with both lateral and vertical adjustments for wear. Guards cover all moving parts of the machine that might cause injury.

Q-D Vise Jaws

The manner in which Q-D Vise Jaws can be applied to the ordinary type of bench vise is shown in the illustration. These jaws, designed for holding work without marring or work of irregular contour, have been placed on the market by The Cornelius Manufacturing Co., 1678 Dorr St., Toledo, Ohio. The

jaws are easily attached to any vise large or small, simply by placing th jaws in position and allowing the coun ter weights to rest on the top slope o the vise body. Each jaw is equippe



Q-D Vise Jaws

with "hook on" buttons to which car quickly and easily be attached a variety of jaws designed for the work in hand

For instance, one set of jaws may be made of rubber or padding for holdin pistons, Moto-meters, hub caps, armatures, and similar work which must no be marred or damaged by holding be





Electric power for welding with this Lincoln Arc Welder costs as little as 5c per hour. You can weld 2 to 3 times faster than by any other welding process. Many machine shops are actually saving from 50% to 75% on their welding costs by the use of this Lincoln Arc Welder. The Lincoln "Junior" Arc Welder is especially designed for use in machine shops. It is fast, easy to operate and it is as reliable as your other electric equipment or your electric lights. With it you can weld steel, sheet metal, cast iron, aluminum or alloys—anything from small light-gauge parts to machine bases and large shafts. Saving so much money, day after day, these welders pay for themselves in a few months' time. Mail the coupon today for details.

THE LINCOLN ELECTRIC COMPANY

Largest Manufacturers of Arc Welding Equipment in the World

THE LINCOLN ELECTRIC Dept. E-407, Cieveland, 0	
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tween steel jaws. Another set of Q jaws can be made up with a variety slots running in both vertical and hozontal directions for holding round square rods, plated pipe sections plumbing fixtures, and so on.

Lindberg Laboratory "Cyclone" Furnace

Lindberg Engineering Company, N. Laffin St. Chicago, Ill., is now build a small, inexpensive laboratory furn designed on the same principle as



Lindberg Laboratory "Cyclone" Fur

production type Cyclone furnace is also made by this company. furnace is intended to meet the der for low temperature units for dra and similar operations.

The Lindberg Laboratory Cyclone nace has a work chamber 8 in. wid 10 in. deep, for which is provide plug type cover that can easily be ! off for inserting the load. The ek heating elements are mounted in a rate chamber, thereby eliminating

gitized by GOOGIC



LUFNIN INSIDE MICROMETER IS ACCURATE, EASY TO READ, EASY TO 'FEEL'

You'll get day-after-day satisfaction from the ingenious LUFKIN inside micrometer. It's just right in weight —you can get the "feel" most sensitively. It's just right in legibility—it's easy to read accurately. It's just right for any kind of inside measuring job—its precision never varies. Equipped with light weight tubular steel extensions, the LUFKIN inside micrometer retains its stiffness and accuracy even when built out to extreme lengths.

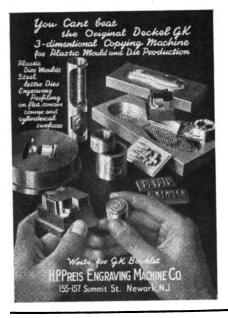
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PRECISION TOOLS TAPES — RULES

SAGINAW, MICHIGAN . NEW YORK CITY



direct radiation to the charge. A powerful blower fan circulates the heated all through the work chamber, insuring rapid, uniform heating.

The furnace is sturdily constructed of heavy steel plates reinforced with structural angles which extend to the floor forming the base and supporting the furnace at convenient working height Efficient slab insulation reduces hearings to the minimum throughout the temperature range up to 1250 deg. For the furnace serves as an accurate an enexpensive pilot furnace for checking up on production or for predetermining the response to specified heat treat ments, as well as for tempering small tools and individual steel parts.

Kirk & Blum Pickling Baskets and Crates

Pickling baskets and crates made of the metal to suit individual require ments are being manufactured by Th Kirk & Blum Mfg. Co., 2816 Sprin Grove Ave., Cincinnati, Ohio. As th result of their accumulated experience Kirk & Blum engineers are prepared t promptly meet requirements for an

ROUGH TREATMENT

 When you buy a Dial Indicator, you make sure that it will be able to toke rough treatment and still registor accuratoly. That's smart buying.

Standard's new SHOCKPROOF construction protects the delicate mechanism from shocks that would destroy the precision of the average dial indicator. STANDARD Dial Indicators can "take it".

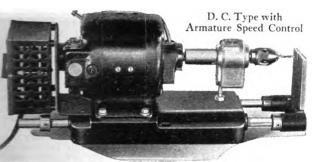
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STANDARD GAGE CO., INC. POUGHKEEPSIE, NEW YORK







Flexible and rapid, the compact Wahlstrom Bench Type Portable Tapper is a big time and labor saver in many plants; capacity 2/56 to ½ inch; the direct current model. Note the apron mounted on sturdy, adjustable supports which can instantly be regulated for a wide range of work. Breakage of small size taps is greatly reduced.

The Wahlstrom Bench Type Portable Tappers

entrical as well as horizontal tapping can be done with the Wahlstrom Bench Type fortable Tapper. Its distinctive design is GOT of the friction type of construction; herefore it is equally adaptable to tapping to tany vertical position or angle—a great dvantage where production embraces variable sizes and shapes of work. The Wahlstrom Tapper is full automatic, operating always on the forward motion when contacting the work; yet it will instantly reverse automatically) at the slightest backward wall of the apron or the work being tapped.

inge in materials is from Steel to Moulded links, or more delicate materials, without links to the threads when reversing.

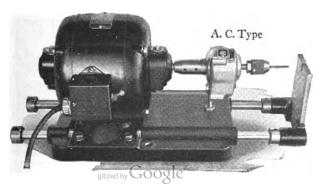
Pertable, easily moved from the to place—saving time and additional handling mental work; capacity 1/26 to 1/4 inch; alternating arrent model illustrated; applendid unit to prevent angestion around permanently located tappers. Production executives should write for an illustrated following the only fully automatic tapper with the migne advantages of Wahl-from construction design.

Equipped with 1/6 H. P. Motor, 1140 r.p.m., with provision for cutting down speed 50% when using maximum size taps.

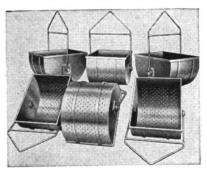
When ordering tappers or requesting information, kindly mention the kind of materials on which the tools are to be used so that you can receive a properly adjusted tapper.



Wahlstrom Tool Division American Machine & Foundry Co. 5502-5524 Second Avenue, Brooklyn, N. Y.



type and size of perforated buckets and baskets, crates, tubs, racks, and lead or rubber-lined steel tanks. Kirk & Blum modern manufacturing methods



Kirk & Blum Special Aluminum Bronze Alloy Pickling Baskets.

skilled metal craftsmen are said to as-

sure sturdy and durable products.

In determining the right alloy and the correct design for a particular pickling problem, the Kirk & Blum engineering department will lend its assistance.

Carboloy Announces New Standard Blanks at Reduced Prices

Carboloy Company, Inc., 2975 E. Jeffer son Ave., Detroit, Mich., announces the development of 3 styles of standar Carboloy blanks available at reduce prices. The 3 styles in 96 sizes hav been designed for wide application based upon experience with thousand of carbide tool applications. They ar adaptable for use on more than 90° of all carbide tools in use today. I many cases, simple revisions in tool de sign will enable users to use thes standard blanks at a substantial savin in carbide cost. These savings will ap ply to standard blanks used by manu facturers in making their own tools, cused in Carboloy "Milled and Brazed" or "Finished" tools.

A number of definite advantages ar offered to those using Carboloy Standar Blanks: (1) Savings of 15% and up o the price of Carboloy in any grade (2) Large-quantity prices on small quantity orders. (3) Immediate deliv (4) Reduction in designing tim and blank cost by using blanks shape to proven tip proportions, and (5) Wid adaptability offers users a chance t



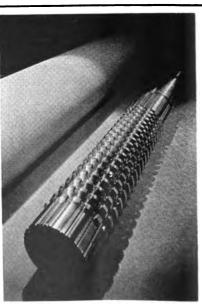
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> MORE parts per grind MORE grinds per broach 25% to 35% Longer life.

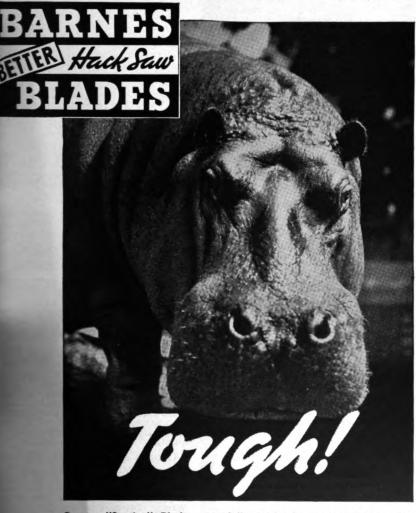
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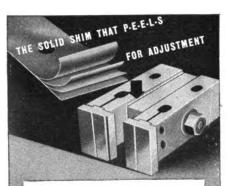


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Setups can be made up from standard tool holders without costly machining and fitting. A real money-saver. Tool holders remain standard for retooling. Write for a sample of LAMINUM.

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Also a complete line of brass and steel thin shim stock, and arbor spacers.

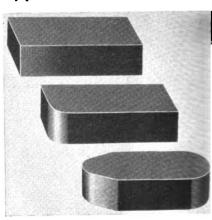
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group purchases on larger quantities.

In addition to the special price reduction on Carboloy Standard Blanks in any quantity, a special reduction has also been made on special blanks in quantities of 500 or over. Special blanks are all blanks other than the 3 standard styles.

The Carboloy Company wishes to emphasize that these are not general price reductions but instead, special reductions made possible through the quantity production. The base price of Car-



Carboloy Standard Blanks

boloy remains at 45c per gram.

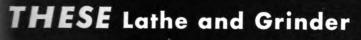
A full explanation, together with th new, low standard blank prices, description of standard tools, and full scale drawings of the 96 standard blank in 3 styles, is contained in a new 28 page catalog-M-37-available upon re quest.

Geneva Precision Dial Indicator

The instrument shown in the illustra tion is the Geneva Precision Dial Indi cator which is now being marketed b Chicago Dial Indicator Co., 180 N Wacker Drive, Chicago, Ill. The out standing feature of this instrument i the precision which is obtained wit the minimum of parts, a lever arm being used in place of the usual multipligearing. The lever arm performs the functions which would otherwise require a gear 1% in in diameter, this construction involving necessity of only one pivot point between the driver an the driven. Readings are thus obtaine in the most direct manner, reducin possibility of error to the minimum.

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Increase the life of your lathe and grinder centers! Get greater accuracy on your work! Eliminate all burning and scoring! Use centers tipped with Carboloy cemented carbide!

Unlike steel centers, Carboloy cemented carbide ap-

proaches the diamond in hardness and has an unusually high resistance to abrasive wear. It is ideally suited to resist the extreme wear on lathe and grinder centers, particularly where the work is nitrided, case hardened, or heat treated shafts.

A large eastern manufacturer writes:

"We have used about 200 Carboloy tipped centers. . . . On continuous production we grind Carboloy centers about once every 4 months. Even then, only a light finish grind is necessary. On one job, Carboloy centers lasted 3 years with one grind, whereas steel centers stood up for one week only!"

Try Carboloy-tipped centers on your lathes and grinders.

Greater Accuracy!

Tipped

with

CARBOLOY

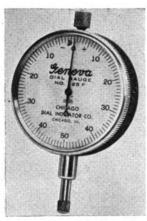
No Burning!

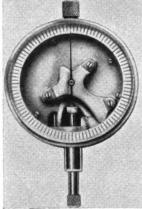
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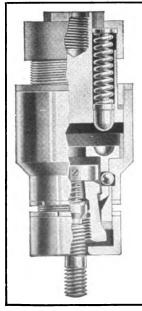


Geneva Precision Dial Indicator No. 125F with Dial 0-50-0 Indicating 0.001 Inch

Interior of Geneva Indicator showing lever arm at start and end of travel.

The case and plunger housing are machined from a one-piece nickel silver casting. The movement is mounted between separate top and bottom plates. The hair spring is mounted between two

flat plates and cannot interfere with the lever rack. Stainless steel and bronz alloy parts are used throughout the make the instrument rust-proof. Special bearings provide for long wear an



TITAN STUD SETTER CONTROLLED DRIVE Assures Perfect Setting

The Titan Stud Setter has a safety clutch which controls driving power.

The Titan is positive in driving and automatic in releasing, thus making it possible to set the studs to any predetermined degree of tightness.

When the studs are driven to the specified tightness, the drive is automatically released and the tool may be removed without fear of mutilating or distorting the threads.

The great capacity, speed range, utility, and safety of this production tool make the Titan Stud Setter a profit-earning tool wherever it is used.

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WE make cold-rolled steel flat wire...high and low carbon for a bost of "hard-to-please" users this product.

of these users have exacting gurenents. Some demand great ghress and resiliency... others inform temper, held within very use limits, Exceptional dimensional tracky, freedom from defects on race and edges, ability to with-and severe drawing strains... are

a few of the other specifications we are constantly called on to satisfy.

Are your flat wire specs in the "real tough" class? If so, you are sure to be interested in our services and products. For over 40 years we have specialized in this type of business and have special facilities to handle it.

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Types:—Roebling Cold Rolled Flat Wire is made from both high carbon and low carbon steels, produced in Roebling's own mills.

The high carbon flat wire is available in tempered and untempered types.

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a minimum of friction. The plunger, which is hardened and ground, has a nickel silver bearing. The instrument is provided with a rotating adjustable dial with positive lock nut. The top knurled nut operates an internal lock for the dial, thus permitting fine settings. The case is of dust-proof design; removal of the back does not leave the parts open to dust and dirt.

The dial is of metal, lithographed for clear, easy reading, black lettering being used on a silver background. The crystal is non-breakable. The instrument is 2 in. in diameter and 7/16 in. thick, not including the curvature of the crystal. The stem is 0.275 in. outside diameter and provides a % in. long bearing for the plunger. The plunger is 5/32-in. diameter with 3/16-in. travel.

Clark Scrap Truck

A recent addition to the line of material handling equipment made by All Steel Welded Truck Corporation, 1123 Railroad Ave., Rockford, Ill., is the scrap truck illustrated herewith. The truck is 46 in. long at the top, 27½ in. long at the bottom, and 18½ in. deep. It is made from 10 gauge sheet metal constructed on a frame of steel angles and



Clark Scrap Truck

having a handle of 1-in. pipe. truck is electrically welded throug and designed for correct balance. it is practically indestructible, proof, and easy to handle.

Standard equipment includes two diameter semi-steel wheels with F type roller bearings, Zerk fittings, one double-row ball bearing caster 6-in. semi-steel wheel and Hyatt roller bearing and Zerk fitting.



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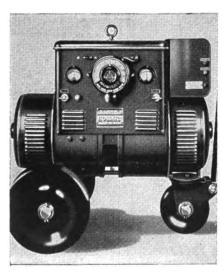


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optional equipment, however, the tamay be equipped with a leg and pin assembly for the Clark Lift Jaci place of the caster wheels.

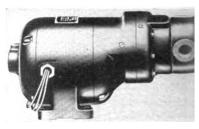
B & S Nos. 101, 102 and 10 Rotary Geared Motorpumps Redesigned

Brown & Sharpe Mfg. Co., Provide R. I., has changed the design and br ened the characteristics with which B & S Nos. 101, 102 and 103 Ro Geared Motorpumps can be equip

The pumps are now made to run in one direction only, either right hand or left hand, the direction being determined by the side of the pump on which the discharge is when located viewed from the motor end. With 8. right hand pump, the discharge will be on the right hand side and with a left hand pump, the discharge will be on the left hand side. The direction of the discharge is indicated by



B & S Rotary Geared Motorpumps



an arrow on the cap of the pump. mechanical seal is now used on tunits in place of the packing heretofore.

In addition to previous listings, i motor pumps are now available three-phase motors, both in 220 and volts, 60 cycle. Similarly, the No. Centrifugal Motorpump is now regu furnished with three-phase, 50 cycle volt motor, 1425 r.p.m. in addition the present listings.

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These "24-hour skylights" of low intrinsic brilliancy need no diffusing medium. The soft long-source light gets down into deep recesses, illuminates vertical surfaces and rests the eyes. All jobs are made easier—wherever sight is used.

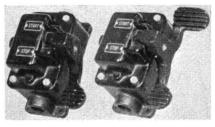
Get the complete story of these new lamps. Let us explain why you can run many more of these light units per circuit with no increase in copper. Write for Bulletin 827DM. General Electric Vapor Lamp Company, 893 Adams Street, Hoboken, New Jersey.

GENERAL ELECTRIC VAPOR LAMP COMPANY

174

G. E. Treadle-Operated, Watertight Push-Button Station

For installations where an operator must have both hands free while starting or stopping his machine, General Electric Company, Schenectady, N. Y.,



(Left)—G. E. Treadle-Operated, Single-Action Push-Button Station. Watertight Double-Action Push-Button Station

has developed a new treadle-operated, watertight push-button station, to be known as the Type CR2940-2A18. device is also especially suitable for use in damp or wet locations. The station is available either with a single-action or a double-action treadle.

The enclosing parts of the sta case and cover, are made of cast and a cast iron foot pedal, or tre is built into the cover. This which operates a standard G. E. duty type push-button unit mot inside of the case, is provided with to limit its travel in either direc With this arrangement, the operator push on the pedal as hard as he without endangering the electrical of the device.

eliminate moisture, gland is fitted on the treadle where the latter enters the case. shaft is also provided with a which guarantees automatic retu the pedal to the neutral position preventing the push-button unit depressed because remaining weight of the pedal or friction packing gland. The blocks, or b in the push-button unit are m molded material and are sprayed a Glyptal paint to prevent their affected by water.

Between the cover, which is b place by four hexagonal head bolt the case is a vellumoid gasket. The is arranged for conduit connection either end and is so built that



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facturing coupled with the expert knowledge of engineers trained to fit the wheel to the work.

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THE STERLING GRINDING WHEEL CO.

Abrasive Division of The Cleveland Quarries Co.

Factory and Office: TIFFIN, OHIO

CHICAGO: 912 W. Washington Blvd. • DETROIT: 101-107 W. Warren Ave.

STERLING DERRESIVES

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be mounted directly on the floor. The conduit connections will accommodate standard %-in. pipe.

Model M and Model O Chronologs

Two new models of the Chronologs, product of The National Acme Company, 124 East 131st St., Cleveland, Ohio, have been announced by that company. The Chronolog is an instrument which provides mechanically a printed record of productive and non-productive time on any machine or operation. A record

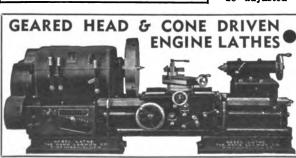


produced by the Chronolog also show the causes and extent of idle time ar a count of the units produced. The Chronolog record may be applied to privide such other production information as may be desired. The two new more els now being announced are of simple field construction and operation. While these two models do not provide much detailed information as the earlier models, they will provide all the daneeded in most plants.

The Model M Chronolog may be a plied to any machine, process or operation. When the operator begins worthe starts the Chronolog, which record the exact minute of the start of to operation on a 4½-in. tape. The window at the upper right shows the clootime. The larger window at the leregisters the number of units produce At any interruption in the work to operator turns the knob at the left a symbol indicating the reason for the interruption, this movement also registering the symbol on the Chronolotape. Thus at the end of the day to operator pushes a button on the from of the Chronolog which records the starting time again on the tape.

Every ten minutes the Chronolo prints the count of units produced ar Visits of the foreman, in the time. spector, stockman or others to the me chine can be recorded on the Chronolo tape. When production is resumed, th printed record shows exactly how man minutes the machine was in operation the number and extent of all interrup tions, and the reason for these interrup With this definite knowledge be fore them, the department and manage ing executives can easily determine th reasons for interruptions of production and take steps to correct them.

The Chronolog can be used as a tim clock at the machine if desired. It ms be adjusted so that the digit whee



Sizes 16" to 36" Swing

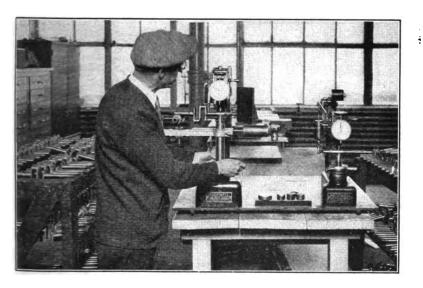
full line of Gap Lathes,

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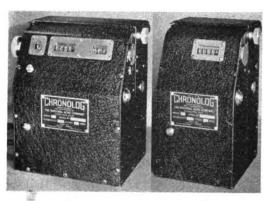
"ROCKWELL" HARDNESS TESTER



OUTBOARD Motor crankshafts, by supporting them on the Vari-Rest, are readily and rapidly tested on the "ROCK-WELL".

The "ROCKWELL", because it is made with such great precision, is suited to research testing and because it is so convenient and rugged, it lends itself to quantity inspection testing.





(Left) Model M and (Right) Model O Chronologs

will give several different combinations. The Model M Chronolog is of simple construction, with nothing to get out of order.

The Model O Chronolog is a very simple device which can be used in a variety of ways. It contains only one set of digit wheels, which may be arranged to count idle time or units pro-

duced. It also carries a roll which automatically prevery ten minutes, although printing may be obtained any time by inserting the and pushing the button on front. This is believed to the only recording cou available.

Landis 40 AX Die H

The Landis Machine C pany, Waynesboro, Pa., added a new die head threading large diameters, thread lengths to their lin threading equipment.

The diametrical capacity the head is 4 in. to 5½ with a pitch range of 7 threads per inch. Thre

length, while not unlimited, is a cient to take in an exceptional rathe head illustrated has a capacit in thread on 5½ in diameter.

The new Die Head belongs to Landmatic Series and is of the opening, pull-off type for applicatio turret lathes and to hand screw chines. It is heat treated throug



AUTOMATICALLY SHARPENS METAL SAWS IN GANGS

Up to $5\,\%$ " diameter and up to $1\,\%$ " thickness. 100 SAWS of 28 GAUGE CAN BE SHARP-ENED AT ONE TIME.

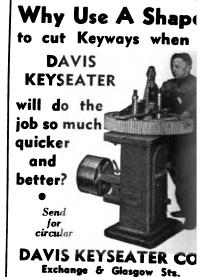
The saws are automatically indexed and sharpened within a variation of plus or minus .001 of exact diameter of entire lot.

WRITE FOR CIRCULAR

THE WARDWELL MFG. CO.

3166 FULTON RD.

CLEVELAND, O.



ROCHESTER, N. Y.

ESIGN ENGINEERS with tough assembly problems can profit from Mr. Nicholson's letter

In telling how he saved 80 per cent of assembly time and labor, Mr. Nicholson eaves nothing much for us to ay... except that a Parkerlady go over YOUR work with you and point out how and point out how and where to use the various types of Hardened Self-tapping Screws to reduce costs and simplify difficult assembly problems.

ind out what you might save-Thether you now make fastenings 👌 with rivers, machine screws or by one other method . . . whether you; esemble metal or plastic materials ... requiring permanent fastenings, e fastenings that can be removed. and replaced repeatedly . . . the chances are 7 out of 10 that you can 🕄 it better at lower cost with one of the various types of Parker-Kalon Hardened Self-tapping Strews, Have us send a Parkerkilon Assembly Engineer to check; ner your work or drawings. Use: his specialized knowledge to locate; all fastenings that can be made the modern, simpler way, without costly) upping and riveting operations.



KRIK. PA.

May 5, 1937.

Parker-Kalon Corporation, 200 Varick Street, New York, N. Y.

Gentlemen:

We shall be glad to permit you to show in an advertisement the Gasoline Hose Nozzle which we assemble with Parker-Kalon Hardened Self-tapping Screws.

Whatever you may write in your copy about the benefits we obtain can be no stronger than actual facts, so you need not submit it for approval.

The truth is we saved about 80 percent of assembly time and labor, and speeded-up production at least 60 percent by using these Sorews in place of rivets. We get considerably safer fastenings and without marring our chromium plated pieces. This method is a great advantage in replacing broken parts in the field. Also, our clearances are maintained exactly, whereas this was troublesome before. To us, your statement that it pays to try out your Screws is no exaggeration.

Yours very truly, NICHOLSON METER & MFG. CO.



Photo indicates where Parker-Kalon Hardened Self-tapping Screws are used on the Nicholson

Gasoline Hose Nozzle.

PARKER-KALON CORPORATION Dept. M., 198 Varick St., New York, N. Y.

PARKER-KALON Modern FASTENING DEVICES

180

and ground for maximum wearing qualities. Diametrical graduations on the circumferential surface and micrometer graduations on the adjusting screw insure rapid and accurate size changes.

The 40 AX Landmatic Head carries 6 chasers mounted on the face of the head similar to the 4-chaser Die Head. By using 6 chasers instead of 4, the cutting load is more widely distributed. Thus the working parts of the head as well as the part being threaded are subject to much less cutting stress. The results are an increase in tool life with more threads obtained per grind of the



Send for Our New 288 Page Catalog

E. A. Baumbach Mfg. Co. 1806 S. Kilbourne Ave., Chicago, III.

Landis 40 AX Die Head

chaser, improved quality of the product being threaded, and also an increase in the life of the die head.

Excelsior No. 27-H Automatic Stainless Steel Sheet Grinding and Polishing Machine

A grinding and polishing machine for polishing large sheets in the rolling mil to be known as "Excelsior No. 27-H has been brought out by Excelsior Too & Machine Co., Ridge Ave., East St. Louis. Ill. The No. 27-H machine built to use commercial abrasive paper in any width specified for 12 and 16 ft endless belts. The assembly is suff ciently heavy for continuous production and it is capable of withstanding th power applied to the belt without set ting up vibration.

The polishing head consists of 2 stee



SPECIFY

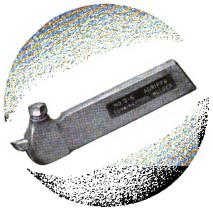
TOOL HOLDERS

Williams' "Agrippa" Tool Holders provide for all regular operations of lathe, planer and shaper. Each line has points of distinct advantage over the usual types, yet "Agrippas" cost no more than widinary Holders. It will pay you to send for our descriptive matter.



CLAMPS

Williams' "C" Clamps are drop-forged from tough, carefully selected steel and are heat-treated. Springing is reduced to a minimum. 5 Patterns, all sizes. Also, Strap and Machinists' Clamps.



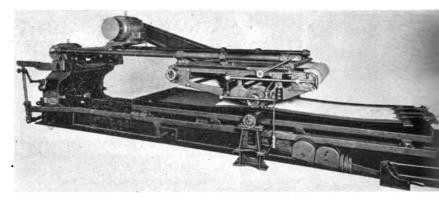
DOGS

All "Vulcan" Lathe Dogs are dropforged. All sizes in Bent and Straight Tail patterns with either single or double screws—both safety and setscrew types. Also Clamp Dogs and Milling-machine Dogs.

J. H. WILLIAMS & CO.

75 Spring St., New York

Headquarters for: Drop-Forged Wrenches (Carbon and Alloy), Detachable Socket Wrenches, "C" Clamps, Lathe Dogs, Tool Holders, Eye Bolts, Heist Hocke, Thumb Nuts and Screws, Chain Pipe Tongs, Vises, etc.



Excelsior No. 27-H Automatic Stainless Steel Sheet Grinding and Polishing Machine

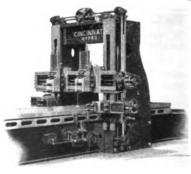
diametrically balanced pulleys with shafts supported on both sides in dust proof ball bearings, mounted in 2 cast steel machine housings. By means of a centrally located flexible rubber covered pressure roll which applies the pressure to the grinding belt by gravity, any desired amount of pressure can be applied uniformly over the entire width

and length of the sheet.

The carriage or table is mechanical operated and adjustable to any lengt sheet which is passed back and for under the grinding belt. The grindin head can be raised and the carria stopped at the extreme forward trav for removal of the finished sheet.

There are no electrical, compressed a





PLANERS

Double Housing, Openside CRANK PLANERS PLANER TYPE MILLERS VERTICAL BORING MILLS

Write for Bulletin

THE CINCINNATI PLANER CO. CINCINNATI OHIO COMMERCIAL DROP FORGINGS . BOARD DROP HAMMERS and DIE MAKING MACHINERY

BILLINGS

THE BILLINGS & SPENCER CO.

HARTFORD, CONNECTICUT, U. S. A.

Wrenches

Serving Industry

Wisitims Alloy



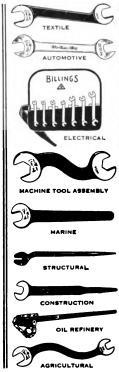


The experienced workman and the apprentice in all types of industries have explicit confidence in Billings Duo Forged Tools—the unquestionable quality, practical designs and their long life on the job, plus the Billings guarantee on every Tool.

There's a definite reason. Progressive modern laboratory research, combined with years of sound forging developments and production experience, is the reason why Billings Duo Forged Tools serve industry.

Write Dept. "O" for the New "Shop Tool" Booklet.

Standardize on Billings Forged Tools—it's an economy.



or hydraulic appliances used to operate the machine or guide the grinding belt on the pulleys, since the belt remains central after the first adjustment has been made. A 3 h.p. motor is used to operate the carriage and a 40 h.p., 1800 r.p.m. motor with V-belt drive operates the grinding belt.

The machine can be located on any floor and operated under any climatic conditions. Cranes or hoists are not required to remove and replace the grinding belts. Changes can be made in a minimum of time.

Ford, Hudson, General Electric and other leaders choose this "Oliver" Grinder

It's a wonder on those small tough jobs — grinding away bits of metal, wood and many other materials quickly, smoothly, and polishing. Its owners find it a dependable time and labor saver. extra fine for circular and angular work. Table tilts 45° down, 25° up. The belt grinding attachment is good for straight line and general work. A favorite of patternmakers. Operates from light socket.

Write for folder

OLIVER MACHINERY COMPANY

Grand Rapids, Michigan



Heat reducing application is accentuated by applying a lubricant to the sheet. The entire process is very simple.

Sunnen Valve Lifter for 60 H.P. Ford V-8

A new L-16 Valve Lifter especially designed for removing valve spring assemblies in the Ford V-8, 60 H.P. motors has been announced by the Sun-



Sunnen Valve Lifter for 60 H. P. Ford V.

nen Products Company, 7903 Manchester Ave., St. Louis, Mo. This new lifter, known as the Sunnen L-16, is made of extra heavy square tubing guaranteed not to bend even when prying out the most stubborn valve assemblies.

A protector plate is furnished with the L-16 which protects the sharp edge of the motor block from injury. With the L-16 the spring is raised by using the large notch end of the lifter. After the prop is inserted, the valve assembly is pushed down and lock on the

THE MASTER LATHE CONVERTER In conjunction with an engine lathe becomes a milling machine. Will mill keyways, internal and external—also splines, gears, etc. It hobs worm gears. It grinds internally, externally, face plate, shaft—at all angles. An entirely new geared type dividing head for lathes now available. Write for illustrated pamphlet. MASTER MACHINE & TOOL COMPANY P. O. Box 7865, North Kansas Oity, Misseuri.

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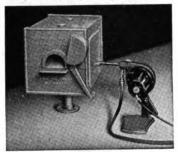
This machine quickly stamps details and serial numbers into name plates.

Write For Particulars

GEO. T. SCHMIDT, Inc.
1806 Belle Plaine Ave., Chicago, III.

"Stark",

"ELECTROBLAST"
High Speed Heat in 20 Minutes



Powerful torch used separately as a very handy portable flame, \$40. High Speed Muffle Furnace, no scaling or decarburization, reaches high speed heat in 20 minutes at 7c per hour; quickly saves its cost. Muffle 7"x3 ½ "x2 ½", \$40. Also a larger furnace with built-in torch, muffle 7"x4 ½ "x3 ½".

STARK TOOL CO.

Originators of the American Bench Lathe Est. 1862 WALTHAM, MASS.



RAGINE DUPLEX BAND SAW

Two Speeds—for cutting wood, steel, brass, copper, tubing, angles, templates.

The ideal all around machine for production shops, tool rooms, pattern shops, laboratories.

Accurate — Fast — Rugged — Modern, High Grade Construction.

RACINE TOOL & MACHINE CO.

1770 STATE ST.

RACINE, WISCONSIN

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Let us explain why this machine is largely used for special taps, single and multiple worms, etc., in tool rooms and factories.

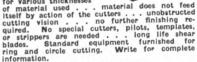
WALTHAM MACHINE WORKS

HIGH SPEED SHEARING

Of Irregular Shapes

Ring and Circle Cutting

The ideal shear forsheet metal workabsolutely a courate and easily operated of metal is sheared and not punched . . . cut anywhere, no starting holes required for inside cutting . . only one adjustment for various thicknesses



LIBERT MACHINE CO. GREEN BAY, WISCONSIN Manufacturers of shears since 1915

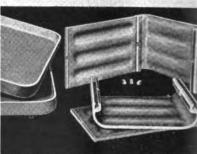


bushing slipped out. The entire assembly can then be pushed up out the block. Direct force can be applied to the stuck guide directly by using the other end of the lifter with a sminotch, inserting it through the spricoil just below end of valve guide.

Hoffman "Flexbox"

The American Manganese Steel Corpany, Chicago Heights, Ill., is introducing the Hoffman "Flexbox" for use carburizing, annealing and other he





Hoffman Flexbox for Heat Treating

treatment processes. Greater operating efficiency is claimed for it is as the outcome of recent tests in production caburizing.

The "Flexbox" is made in six separate parts of heat and abrasion resistant Amsco alloy. The corrugated sides at tongued to fit into grooves in the corrugated ends and may be keyed in plac. The frame thus formed nests on flanged bottom plate with legs for batc type furnaces and has a flanged cover which fits over the box. A special type of "Flexbox" is made with the bottop late fitting and plates for use when the contents must be lifted with the box.

Improved Anderson Balancing

Ways to Leveling Required

Required
simple
and excellent
evice for
alancing,
traightening
at trueing.

They are made in the following sizes:

Swing	Greatest Distance Between Standards	Capacity in lbs.	
20 in.	20 in.	1,000	
40 in.	30 in.	2,000	
60 in.	30 in.	2,000	
72 in.	66 in.	5,000	
96 in.	88 in.	10,000	



Write for Full Information ade Anderson Bros. Mfg.Co.

926 Kishwaukee St., Rockford, Ill.

Sebastian Motor Drive Attachment For Cone Head Lathes



● For any make of lathe from 8" to 20" swing. Does not obscure vision. Easy to attach—low in price.

12"	SIZE	55.00
16"	SIZE	63.00
20"	SIZE	90.00

The Sebastian Lathe Co. GINGINNATI, O. U. S. A.

-NEW

U. S. No. 1 Anti-Friction Bearing

Hand Milling Machine

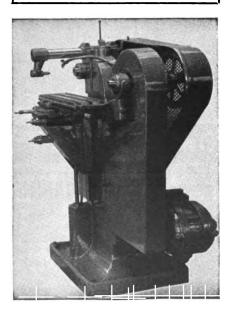
The New U. S. Hand Miller is particularly adapted to high speed light milling operations. Vertical and horizontal feeds.

Improvements: Heat treated chrome nickel steel spindle, Timken bearings, Ballbearing countershaft, V-belt drives, 6 Spindle Speeds up to 1592 p. M., providing efficient use of small end mills.

Write for full details.

The UNITED STATES MACHINE TOOL Co.

1954 W. 6th St., Cincinnati, Ohio



It is claimed the "Flexbox" does away with the distortion or cracking commonplace in furnace boxes of solid cast or welded construction, brought about by alternate heating and cooling. Sufficient clearance is provided between tongue and groove to absorb expansion from heating of the parts and to allow contraction in cooling. With this new design, however, there is no appreciable gas leakage at the joints.

"Flexboxes" are lighter than ordinary boxes; therefore easier to handle. Should a section of the box fail, it can be easily and quickly replaced at a frition of the cost of an entire box. I scriptive literature is available from t maker of this equipment at their Clago Heights, Illinois office.

Microhoner

It is now possible to hone bores do to ¼ in. diameter, in production, witolerance for roundness and straighth held down to twenty--five millionths an inch, by the use of the No. 1 Michoner, now being announced by the Acromatic Hone Corporation, Dubois a Horton Sts., Detroit, Michigan. The Acrohoner is a new type of honing mediameter range from ¼ in. to % with maximum length of 2¾ in. smaller diameters up to and includingly in, for larger diameter sizes.

Production ranges up to 180 to 2 pieces per hour, removing 0.0007 0.001 in. of stock from a ground hole hard metal, and as much as 125 to 1 pieces per hour, depending upon bo diameter and length, removing fro 0.001 to 0.002 in. of stock from a ream broached, or precision bored hole cast iron or soft steel. "Microhon mirror Finish" is produced with a fr cutting action in one operation fro a ground surface on hardened parts a precision bored, reamed or broach surface on soft steel or cast iron. well as some non-ferrous metals.

The Microhoner incorporates tiunique and simplified principle of wobble plate, indicated at No. 4 in Fig. to obtain a high speed, mechanic reciprocating motion, which, combin with rapid rotation, accomplishes the abrasive to produce a cross-hatchehoned finish. Any desired variation ocrosshatch, or relative speeds of open



Danly All-Steel Sets
Danly Commercial Sets
Danly Die Makers' Supplies

DANLY SERVICE

8 Danly Warehouses Provide 24-Hour Service for 85% of All Metal Fabricating Plants

DANLY MACHINE SPECIALTIES, INC.

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HAMILTON ELEVATING TABLES

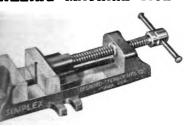
Save time and money in lifting and handling heavy dies, tools, etc., in your tool room or stamping shop. All steel construction—anti-friction bearings—furnished with hand or electric power. Special tables built for your requirements. Write for illustrated circular.

THE HAMILTON TOOL CO.
HAMILTON OHIO



SIMPLEX

DRILL PRESS AND



well designed, strongly constructed vise general shop and tool room use on presses and milling machines. Has slot for holding round vertical work d exclusive bronze bushing insures easy eration of the screw. rite for circular "M" and name of your

esmond - Stephan Mfg. Co.

URBANA, OHIO

TEEL EQUIPMENT

tools and Chairs
flue Print Cabinets
Aachine Tenders
foreman's Desks
Jench Drawers
Tool Cabinets
Work Benches
Bench Legs

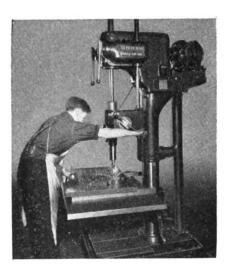


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ANGLE STEEL STOOL CO.

"The Steel Equipment People" PLAINWELL, MICH.

CLEEREMAN DRILLING MACHINES



Sliding Head—

Round or Square Column

At work in the plant of the Brust Tool Manufacturing Company, Chicago, well known makers of precision tools and fixtures, this round column 25" Cleereman Drill is giving highly satisfactory performance. . .It is fully geared... has anti-friction bearings... is automatically oiled... has single lever control of feeds and speeds... can be furnished with square column and in special arrangements... Write for descriptive bulletin.

Cleereman Machine Tool Co.

GREEN BAY, WIS.

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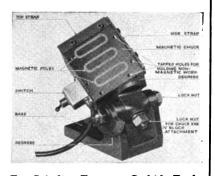
190

tion can be obtained by interchange of pulleys (14).

Unit time cost per piece is minimized by leaving the operator's hands free for holding the work, or for making adjustments and providing foot control for starting and stopping the machine. A single foot movement by the operator engages the clutch and expands the hone to start the machine. One foot movement stops reciprocation and rotation, while releasing the clutch and applying the brake simultaneously with the collapsing of the hone.

The same proven features of construction and operation incorporated in

COMPOUND ANGLE MAGNETIC CHUCK



For Grinding Tungsten Carbide Tools, Form Tools, etc.

Write for Circular.

Grinding Machinery Co.
2332 E. Grand Blvd., Detrolt, Mich.
AGENTS WANTED

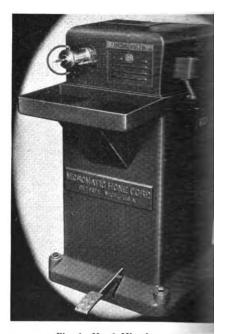


Fig. 1-No. 1 Microhoner.

all Micromatic production honing to are also included in the Microhoner, a comprise: Constant Pressure of Abrasis—The honing sticks are held rigid against the bore wall by a controlle constant pressure which is regulat through a caged feed spring (6) it dependent of the influence of tl operator. The angle of taper on the stone holders and the body of the to is beyond the angle of reversibility is that no amount of pressure on the stones will collapse the tool by backin

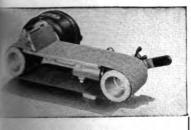
Metcalf Emery Wheel Dresser

Dresses wheels up to 14" diameter and can be used on all kinds of wheels... Cuts out bond or filing and leaves cutting particles standing out sharp and clear... Does not grab and tear the wheel...

Send for descriptive bulletin.

COVEL-HANCHETT Co.

BIG RAPIDS . MICHIGAN . U. S. A



NEW ABRASIVE

"Built Like a Machine Tool"

Hormel-M Grinder is sturdily built with apporting leg under the grinding table to minate vibration and tipping due to pressure the beit. Ball bearing throughout. Equipment ALEMITE LUBRICATION complete brease gun.

Write for illustrated folder on this and other styles and sizes.

HORMEL-M GRINDER

WALLS SALES CORP.

WARREN ST.

NEW YORK, N. Y.



Counters for Metal Working Machines

Production on punch presses and many other machine tools is checked off accurately by these sturdily built Productimeters, B-1 above wing nut reset, or tumbler lock reset.

Productimeters ITHE SPEEDOMETERS OF INDUSTRY

DURANT MFG. CO.

1932 N. Buffum St. 173 Eddy St. Milwaukee, Wis. Providence, R. I.

TELL US WHAT YOU WANT TO COUNT

MORE FOR YOUR MONEY

in The Bincinnati

12" & 14" Pedestal Grinders

You get "more for your money" in these NEW 12" and 14" Pedestal Grinders. These fine new tools have the same high quality as always yet look at these remarkable prices.

Grinder complete with 2 H.P. motor and two 12"x2" wheels, \$200.00.

Grinder complete with 3 H.P. motor and two 14"x2\frac{1}{2}" wheels, \$250.00.

Send for new Catalog, just off the press.

THE CINCINNATI ELECTRICAL TOOL CO.

CINCINNATI
Division of R. K. LeBiond Machine Tool Co.
Builders of Electric Drillis, Screw Drivers, Nut Setters,
Tappers, Valve Grinders, Aerial Grinders, Tool Post
Grinders, Buffing & Polishing Lather, Bench and Pedestal



up the feed spring. Automatic Feed;—Continuous feed or expansion of the stones (7) during each cycle of operation is obtained without resetting by the operator for each piece of work honed. Predetermined Setting Device;—Expansion of tool is controlled through

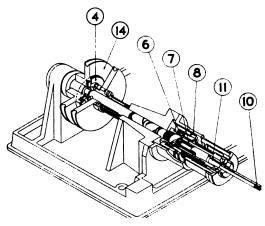


Fig. 2—Drawing illustrating features of design of No. 1
Microhomer

calibrated adjustment (8) which can be made while the machine is in motion. Low Operating Cost; - Abrasive sticks are mounted on inexpensive die cast holders (10) which are easily and quickly replaced on machine. Interchangeable Hone Bodies;-Hone bodies are available for every 1/32 in (.79 mm.) increase in diameter of bores. All hone bodies (11) are interchangeable on the machine, and are made with bayonet lock to facilitate quick interchange.

The honing sticks are held rigidly against the bore well by a controlled.

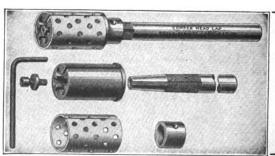
constant pressure which is re through a caged feed spring, in ent of the influence of the o The angle of taper on the stone and the body of the tool is bey angle of reversibility so that no of pressure on the stones will

the tool by backing up a spring. Continuous feet pansion of the stones, each cycle of operation, tained without resetting operator for each piece honed. Expansion of tis controlled through cated adjustment which can be while the machine is in tion.

All working parts an of hardened or heat steel and the machin withstand long, hard Steel bodies, made with onet lock for quick change, are available for 1/32-in. increase in bon eter within the above Stones are mounted of pensive die cast stone and are easily and quich placed on the machine.

The machine is ed with coolant tank, pur efficient filter, with the discharge piped to the honing spindle head and motor equipment includes 1725 r.p.m., 60 cycle, 3 phase motor.

Eisler Air-Operated Spot Wan air-operated spot welder de so that the welds are control means of a solenoid starter habrought out by Eisler Engineers Inc., 740 South 13th St., Newark By depressing the starter, the sactuates the air cylinder which is



LOWER YOU

With Copper Head Expansion Profitably used in hundreds of ing shops. Available in size 1/8" to 2 1/2", graduated by six of an inch.

Many other designs for sp applications. Write for Bulletin

BOYAR-SCHULTZ

CORPORATION 2120 Walnut Street, Chicas

FOP BELT SLIPPING!



VACUUM CUP METAL PULLEYS

preserved to: Eliminate belt allipsee and preser loss . . Increase life of belts and preserved to the second to th

Vacuum Cup Metal Pulley Co., Inc.

STAMPINGS



We have been in the job stamping business for over 20 years, and have a well equipped plant with 30 presses ranging from small size up to 30 ton ram pressure.

We are equipped to make our own dies in our modern die shop.

Send sample or blueprints for estimate to Dept. 1.

WUEST BROS.

930-936 W. Hill Street, Louisville, Ky.

MARKING

FLAT—ROUND
IRREGULAR SURFACES
BY ROLLING
OPERATION



MODEL 25 HI-DUTY MARKING MACHINE

This machine operates from your plant air line, and is one of numerous models built to produce fast, neat marking on metal parts. Hi-Duty marking machines may be had for practically any marking operation, and we will be glad to make recommendations upon receipt of your inquiries. Send prints or samples of parts to be marked, showing lettering and location, also state required production.

GEO. T. SCHMIDT, Inc.

1806 BELLE PLAINE AVE. CHICAGO, ILL.

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closes the electrodes upon the work. The duration of the welding period is regulated by the automatic timer and contactor, assembled on the side of the fabricated frame. The timer is adjustable to regulate current from 2 to 60 cycles in 110 divisions. An air pressure valve on the machine is used to regulate the proper air pressure; this welder operates on an air pressure of 35 to 60 lbs., depending on the nature of the work.

Variation in type of work is facilitated by the interchangeable arms available on this welder. Arms shaped for



Eisler Air-Operated Spot Welder

SPEED
DRILLING

U. S. Multiple Drill Heads are made for drilling 4 to 50 holes at once. Thus, you get more holes per minute and larger profits. Our years of specialization in this work will save you money and assure an accurate, dependable and swift job. Send your blue prints for estimates.



United States
Drill Head Co.
1954 Riverside

Drive CINCINNATI, OHIO

welding different types of work ca substituted for the arms illustrated lower arm can also be raised or lo to conform to the depth of worl quired. This welder is especially equ These with strong arm supports. ports make possible the long arms, at the same time, permit the arr slide in or out of the supports to the type of work being welded. A cooling arrangement Dasses through the arms, electrode holders electrodes-water is circulated very to the end of the electrodes. The on this welder are 36" long; arms be supplied from 36" to 48" in le

This welder is capable of makin to 100 spots per minute. It is equ with an 8-point hand wheel for regulation and has an air-cooled t former.

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Furnished with adaptor
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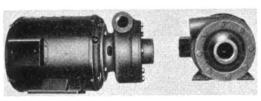




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cants. The new unit is an open impeller type pump directly connected to a full ball bearing, long hour, moisture proof motor.

This type of pump has a number of worthwhile advantages of particular interest to machine tool builders and



Pioneer Horizontal Pump

users. It has been designed and built for maximum efficiencies and maximum heads. It is ideally suited to installations where maximum heads are essential, as, for instance, in multiple or deep hole drilling, in coolant supplies that are filtered or in central reservoir systems serving a battery of machines. It offers the further advantage of providing greater volumetric control and maximum flexibility in both application and service.

Although the pump is normafly in stalled in a horizontal position, it is not limited to horizontal installation. Due to special bearing design it may be set vertically if desired. Its perform ance will be the same in either case. Instead of the conventional packin

gland, a special mechanical see is used at the shaft opening. This permits shortening the distance between the pumbearing and the impeller beform 4 to 10 inches—making the installation very much more compact and preventing shaft whip otherwise so troublesome in the impeller type opump.

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In pumps of this type increasing the effective head reduces power demand when the head is increased to infinity as it is when the discharge line valve i closed, power demand drops to a poin just sufficient to overcome the hydrauli



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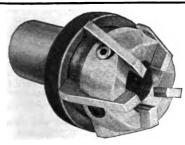
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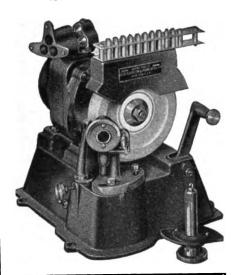
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friction of the impeller. Conversely, reduction in effective head increases power demand in the same ratio. Thus a motor operating at capacity in an installation having a very high head will not be suitable if the head is materially reduced because of the serious overloads developed. To avoid any possible operating difficulty of this character the Pioneer Pump is powered for the lowest possible head. Consequently, regardless of how the effective head may be varied, Pioneer Pumps will not suffer overloading from that cause.

From the above, it will be evident



that the impeller type pump requir no relief to bypass valves in the deli ery line to protect the pump when coc ant supply is throttled. This simplifi pump piping and reduces its cost.

Another advantage is that this un operates at normal motor speeds—is speed reductions are necessary unle highly viscuous liquids are encountered Inasmuch as single phase, two or through the motors are available with the pump, its use does not necessitate unbalancing the phase load of the plan. The Pioneer Horizontal makes an ide pump for remote location such as it handling of coolant or lubricant for group of machines from a single centreservoir.

B & S Master Feeding Finger

The illustration shows the mast feeding finger and pads which have been brought out by Brown & Sharj Mfg. Co., Providence, R. I. The fing is made of high grade steel and is give



B. & S Master Feeding Finger

a spring temper treatment in order to obtain the maximum tension for holding the pads and stock. Pads of hardenes steel, bronze or cast iron can be used and are interchangeable. The two pad used with the finger take the wear from the finger, thus making for economy if the manufacture of screw machine products.

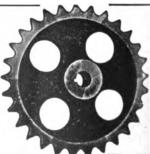
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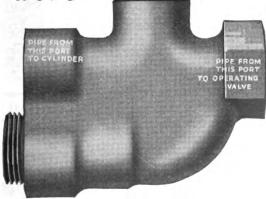
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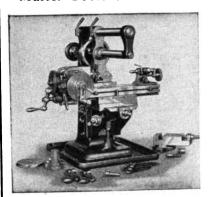


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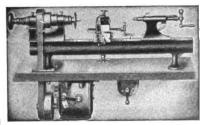
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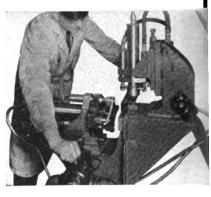
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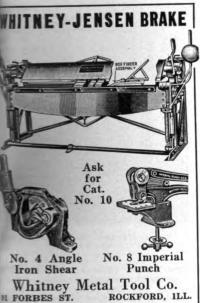
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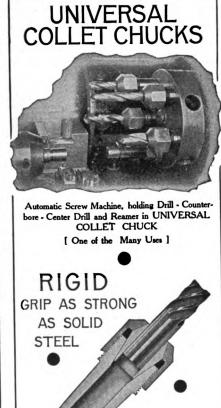


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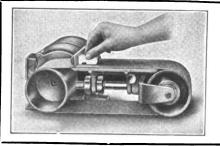


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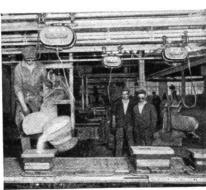
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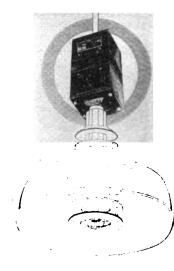








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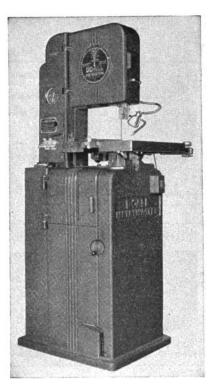
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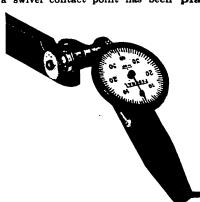
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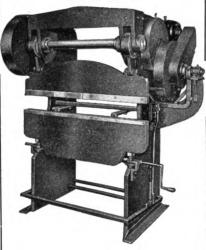
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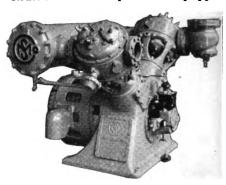
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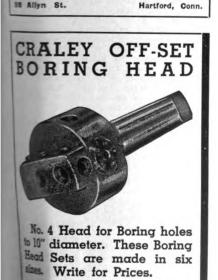






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clearance of 14-in. vertically and 14½ in. horizontally. It may be used in a rigid upright position for sheet metal, pattern work, sawing sprues off castings, or any work for which a rigid upright saw is applicable. The table is arranged



Wells No. 7B Vertical Band Saw

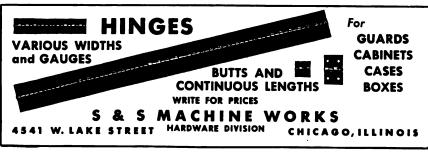
to tilt 45 degrees right and 10 degrees left.

The upright saw frame is hinged at the bottom and may be released and fed into the stock automatically. The stock is clamped on the table with a vise which is provided, or by using the T-slots and clamps, a greater variety of work may be done.

The upright frame may also be swung down to the floor where gates and risers may be cut off from large castings which are too heavy to place on the table. The capacity at this point is 14x18 in. Bar stock up to 6 in. may also be cut at this position. In fact, this machine lends itself to an incredible variety of work that it seems surprising.

Link Spring Checker

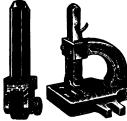
A compact, self-contained accurate device especially designed for the single purpose of testing compression springs has been placed on the market by Link



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NEWARK, N. J.

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STACKRACKS save time spent piling and unpiling boxes of stock. Every box is always accessible in these individual racks of heavy steel that lock together into a unit of any size or shape. Shop boxes slip into them like drawers in a file cabinet.

STACKRACKS are built to any size to fit your shop boxes. They are assembled into units without using any tools. No matter how high they are stacked or how heavy their load, the patented construction of STACKRACKS assures a positive lock which holds the units tightly together. They are built of channel and formed steel, strongly welded and finished in baked-on enamel.

Send the coupon today for the whole story of STACKRACKS. It costs you nothing to find out how STACKRACKS can help you.



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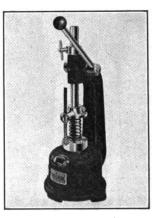






Engineering & Mfg. Co., 1056 W. Baltimore Ave., Detroit, Mich. The checker is made in two sizes: the No. 1, which has a 50-lb. capacity and is calibrated in ¼-lb. units, and the No. 2, with a capacity of 250 lbs. and calibrated in 1-lb. units. The checker is simple to operate; the operator simply places the spring in the machine, pulls a lever, and obtains an accurate reading on the scale and dial, which show the length and pressure.

All essential moving parts act in a



Link Spring Checker

straight line, enabling the checking of springs to be done with the utmost rapidity. The weighing table is mounted on centrally located pilot-shaft ball bearings, eliminating friction and lateral movement. This is essential for direct pressure reading. Overloading is prevented. When the maximum capacity is reached, the weighing unit is relieved of further load. The accuracy of the checker is guaranteed closer than the government requirements.

Motion Picture Dramatizes Lubrication in Modern Industry

A unique motion picture dramatization of lubrication methods in modern industry, one of the most comprehensive studies of its kind ever attempted, was shown for the first time recently in the preview theatre of Radio City Music Hall, Rockefeller Center, New York. More than 100 representatives of the trade press saw the first public screening of the new film as guests of P. M. Gordon, Manager of the Indus-

trial Department of the Socony-Vacuum Oil Company, producers of the picture.

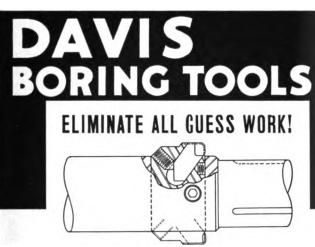
The new film, called "The Inside Story," is done in a "March of Time" style. Unusual animated drawing and striking photography are used to lilustrate correct lubrication of various types of machinery. A microscopic film of oil assumes the hero's role in this industrial drama. But for this film of oil, the picture points out, many of the common daily conveniences of modern life, now within the reach of millions of people, would never have been possible. The story of the fundamentals be-

hind correct lubrication is told by showing bearings, gears and cylinders—the essential elements of all machines — and demonstrating how they operate, how they are lubricated and the lubrication needs of various types.

After a quick review of the field of industrial and mechanical progress, presented in effective photo-montage, the film demonstrates the need of lubrication to protect moving parts. The spectator sees the results of friction when two highly pollshed surfaces move on each other. Microphotographs, en-larged until they cover the whole screen, show the reasons for friction, the fact that even highly polished surfaces are covered with hills and dales which the unaided eye Varicannot see. ous bearings are then shown and an animated drawing shows just what goes on inside, how lubrication prevents metal to metal contact.

In a similar way, the lubrication of gears is illustrated with animated drawing showing how a gear transmits power and how the lubricant provides protection.

Another series of pictures shows the work that correct lubrication does in protecting the moving parts of various prime motors—the Diesel engine being selected as an example. Animated drawings make clear the principle upon which the engine operates and the manner in which explosions are translated into usable power. Further drawings illustrate what a lubricant must do if efficient operation is to be maintained.



In this remarkable new Davis Boring Tool, note how the cutters can be adjusted independently, while the block is locked in the bar! This saves operating time—means more accurate adjustment of cutters—eliminates complicated set ups—reduces grinding to sharpening—positively eliminates all guess work, and literally brings about 100 per cent accuracy and efficiency!

Let Us Design a Tool Like This for You

DAVIS BORING TOOL CO., INC. ST. LOUIS, MO.

The new film will be shown to business organizations and to groups of plant managers and factory executives in industrial communities throughout the country. Production of this film is



Microphotograph (from Socony-Vacuum film) of the surfaces of a bearing and journal. Note that even these highly polished metal surfaces are covered with tiny hills and dales not discernable to the naked eye. Were these two metal surfaces to make direct contact, the tiny hillocks would resist each other, slow the mechanical action, and cause wear. A thin film of oil, indicated by the white line, keeps the two metal surfaces from touching and thus reduces friction to the minimum.

Socony-Vacuum's answer to a growing demand among plant managers for a simple, complete and straight-forward discussion of the subject of industrial lubrication.

Crucible Spot Steel Stock Book. This booklet, now being distributed by Crucible Steel Company of America, Dept. MS, Chrysler Bldg., New York, N. Y., gives complete listings of alloy and machine steels, and more than fifty brands and grades of tool and high speed steels -spot steel which is available for immediate delivery. Included in the booklet, which contains more than ninety pages, are tables, weights, measures, and other valuable information. Copy free upon request. Please indicate whether you want the Atlantic Seaboard, Central or Western Edition.

Bulletin No. 6165, issued by Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill., describes the F-M line of duplex, self-oiling pumps for handling mud and slush, clear water, petroleum products and other liquids.

These sturdy pumps are offered as basic units; for belt drive; and with top-mounted or tandem-mounted mo-They are available with capacities from 23 to 94 gallons per minute and with pressures up to 475 lbs. per square inch.

The bulletin, in a sectional view. points out and describes those construc-

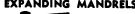


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THE ROTARY FILE COMPANY









They act as in-ternal chucks for holding work while

being machined on lathes, millers, grinders or shapers. Made in 14 diff sizes, taking bores of every fractional part of an inch from ½" to 7". either singly or in sets. Builetin 530. Made in 14 different

CONTROL VALVES in 2, 3 and 4 Way Types for operating single and double acting air, steam, water or oil Gylinders, made in Lever, Foot, Bolenoid and Motor Styles, for pressures up to 300 lbs. Hydraulic Valves lever operated up to 2000 lbs. Other products—Arbor Press, Flexible Couplings, Steel and Stainless Steel Ball Floats, Steem Traps, Steam Separators, High Pressure Air Vente.

W. H. NICHOLSON & CO.

136 Oregon St., Wilkes-Barre, Pa.

tion features that contribute to excellent, dependable performance under severe conditions. The different construction features and materials with which these pumps are available make them adapted to many service demands. Copy free upon request.

1937 Electric Motor Bearing Catalog. For the busy man who is responsible for the selection and installation of Motor Bearings, the Johnson Bronze Company, New Castle, Pa., has just released a new complete catalog for 1937—Johnson Electric Motor Service Builletin EM-7.

This valuable Bul-18 an indisguide to pensable the bearing user and is complete in every Over detail. Electric Motor Bearings are individually illustrated and described with necesspecifications SATY throughout. For convenience and reference Aleasy phabetical Progressive and Numerical Size Listings including bearings for any type motor are incorporated.

Other important features of this new Bulletin EM-7 are the sections on Universal Johnson Bronze Cored and Solid Bars: Hexagon Bars; Johnson Lead-Base and Tin-Base Johnson Babbitt: General Purpose Bronze Phosphor Bearings.

Interested parties may secure this valnable informative EM-7 bv Bulletin writing directly to the Johnson Bronze Company, New Castle, Pa., or to this publication. The Johnson Bronze Company also offers an unusual consulting service through a competent staff of engineers and metallurgists available at all times in solving bearing problems.

Taps: How to Choose and Use Them. This 12-page folder has been published by Union Twist Drill Co., Butterfield Division, Derby Line, Vt., to answer the many questions that have been asked in the past regarding the best style of tap for the various purposes, the best type of tap for use in various materials and why different lubricants should be used on different kinds of tapping jobs. This treatise will be valuable to everyone who buys or uses taps. Copy free upon request.



FEDERAL PRODUCTS CORP.

1144 EDDY STREET, PROVIDENCE, R. I. Detroit • Chicago • Muncie • Cleveland • New York

Wheels Grind Abrasive Carboloy, and Other Tungsten Carbide Tools. This eight-page folder, now being issued by Abrasive Company, Tacony & Fraley Sts., Philadelphia, Pa., gives definite and clear-cut instructions for sharpening carbide tools. Beginning with a discussion of the two basic forms in which carbide tools are of-fered to industry, the text carries the reader through a series of descriptions in which he is told how the tool should be used in wet and dry grinding, the physical properties of a wheel for suc-cessful grinding of tungsten carbide,

be fed across the face of the wheel, th grinding of forming and cut-off tool wheel speeds, wheel dressing, and a on. A copy of this folder will be set free upon request.

the manner in which the tool shoul

Gatco Precision Products. The line rotary, jig and pilot bushings, boriz bars, boring machines, and univers duplicators made by Giern & Anhol Tool Company, 1310 Mt. Elliott Av Detroit, Mich., are presented in a loo leaf catalog which is now being distribu ted by this company. Copy free upo request.

Advanced Sourcebook "Spring of Knowledge. One of the most comple semi-technical discussions of spring making in all its forms is now offer by Barnes-Gibson-Raymond, 6400 Mill Ave., Detroit, Mich. It represents a ditinct advance over their last catalo published in 1931, and reflects in a hig degree the current trend away from the stereotyped catalog of product Eighty-eight pages of usable informs tion about spring selection and design most of it published for the first tim make this a book to be welcomed 1 any file of engineering data.

In addition to discussing the charac teristics of the many spring types, nu merous problems in design are actual worked out for easier understanding The subject matter is clearly indexe and conveniently grouped for reference and tables and formulas have been com piled for quick, accurate use. The F G-R sourcebook represents a large in vestment in time and experience an should be valuable for the help it ca give in buying or designing springs. I will be sent without obligation to an executive, engineer, designer, or pur chasing agent who requests it on him. business letterhead.

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for general machine shop and tool room use on dies, jigs, fix-tures, and machined tures,

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71/2 In. Rotary Table for Small Miller Tables

Send for circular.

STEVENS ROTARY TABLE DIAL INDEXING TYPE

Table graduated for single degree reading. Worm can be disengaged for turning table by hand.

Other sizes 12", 18" and 24" diameters.

JOHN B. STEVENS INC. 306 HUDSON ST. NEW YORK, N. Y. "Handy & Harman Precious Metals Refining Service" is the title of a 12-page book describing and illustrating the facilities available at the Handy & Harman plant, Bridgeport, Conn., for melting and refining precious metals. This plant offers the advantages of laboratory methods which are said to be looked upon by many as the standard for comparison in precious metal assaying. Available to such customers are the services of a staff of expert chemists and metallurgists. Copy of this booklet free upon request.

Lyon Steel Shelf and Shop Boxes. attractive new catalog on Steel Shop Boxes has just been published by Lyon Metal Products, Inc., Aurora, Ill. new catalog completely illustrates and describes a wide range of steel boxes for every manufacturing and storage useshelf boxes for the storage of small parts; shop and tote boxes for transportation of work in process by truck, conveyor or lift truck; stacking boxes, nesting boxes; and suggestions for the use of special steel containers designed to be used with specific production systems. In addition, the new catalog contains brief descriptive matter on Steel Shelving, Lockers, Shop Equipment and Tool Storage Equipment. Copy free upon request.

"Plain Bearing Motors Saved". Plain bearing motors which are inefficient in operation or whose bearings have failed are easily converted to the ball bearing type with the Fafnir Wide Inner Ring Ball Bearing Motor Cartridge, described in a new circular, "Plain Bearing Motors Saved", issued by The Fafnir Bearing Company, New Britain, Conn.

The circular points out that every motor user would like to enjoy the advantages of ball bearings: elimination of wear, maintained air gap, foreign matter excluded from bearings, no oil leaks into the windings, and low labor cost for lubrication. By actual test, the company states, a group of plain bearing motors demanded 142 repairs, operating over the same period of time and under the same conditions as an equivalent group of ball bearing motors, on which only six repairs were required.

Conversion is simple with the Fafnir Cartridge. The end-bell is bored out, and the cartridge is bolted or welded into place. The Fafnir Ball Bearing Motor Cartridge is supplied in 43 sizes, for shaft diameters from 13/16-in. to 3½-in. Copy free upon request.



"EDGEMONT" *FENTES FRICTION CLUTCHES DISC "TYPE SF"

Install this superior clutch on those hard or troublesome drives, and end clutch problems for good. Performs best because it is designed, and built best. Releases instantly at high or low speed, and can quickly be adjusted for liner wear.

Complete data on request.

The Edgemont Machine Co.



Williams Wrench Booklets. J. H. Willams & Co., 75 Spring St., New York City, announce the publication of two new booklets which will interest every buyer and user of industrial wrenches.

Booklet A-409 illustrates and describes Williams' full line of "Supersocket" Wrenches (Detachable Sockets); "Super-renches" (Chrome - Molybdenum); The "Superector", a new, heavy-duty, reversible rachet wrench; "Non-Sparking" Safety Wrenches (Beryllium-Coppr); and their two recently announced lines of Adjustable Wrenches.

Booklet A-81 describes the full drop-





forged Carbon Steel Wrench linepatterns, more than 1000 sizes. "E Dog" types and Screw Wrenche are sincluded. This booklet also lists "Superector," Adjustable Wrenches, superector," Adjustable Wrenches, superector," Safety Wrenches,

"Non-Sparking" Safety Wrenches.

Copies may be obtained by writthe manufacturer.

Rotor Air Tools. A handsome apage book in color devoted to the drills, reamers, screw drivers, nut sters, wood borers, grinders, buffers, sed ders, wire brushing tools and other operated equipment made by The Roo Air Tool Co., Cleveland, Ohio., is no being distributed by this firm. Includare illustrations and descriptions each of the tools mentioned, togeth with photographs of various jobs upwhich these tools are shown at work Copy free upon request.

Analysis of Shrinking Profit Margin The discussion of this subject is prosented on a 22x34-in. sheet, printed color and including photographs and drawings illustrating the features and uses of the Monarch lathe and its acces sories. The broadside is being distribu ted by The Monarch Machine Tool Com pany, Sidney, Ohio. The 28 illustration include photographs of the Monarch Keller form turning and boring machine close-up view of the Monarch Cen trode device (which makes it possibl to turn, bore and face shapes other than round) in operation, jobs turned ou on a Monarch lathe equipped with Cen trode device, the Monarch tool splass guard and rear necking turret, the Monarch Magnamatic all electric full au tomatic double carriage lathe, an 18 in. phantom view of a Monarch lathe showing the arrangement of the gear and bearings, and a line drawing of s typical Magnamatic set-up. Copy of this brochure free upon request to the above firm.

DO YOU WORK FLAT SHEETS 1

Use Wales Individual, Self-Contained Hole-Punching & Notching Dies to cut costs, set-up time and the number of different dies required.

Re-locate for new parts—operate in press or press brake—standard holes up to \(\frac{7}{6} \), square notches up to 5 x 5--also Vee notches—in 14 gauge steel or under.

Write for Catalog

THE STRIPPIT CORPORATION

Buffalo, N. Y.

High Intensity Mercury Lighting. A mislog describing many types of industrial lighting equipment for use with 200 and 400 watt high intensity mercury upor lamps has been published by the Westinghouse Electric and Manufacturing Company. Combination mercury-incandescent units are also described. Included in the catalog is information on designing an installation, choosing mounting heights, spacing and size of mits for different wall and ceiling conditions, and average resultant lighting mensity. Vapor proof units for severe ervice conditions are included. Copies of the catalog are available from the Lighting Division, Westinghouse Electric and Manufacturing Company, Cleveland, Ohio.

How to Plan a Materials Handling system. In this eight-page folder the Cleveland Tramrail Division of Crane & Engineering Co., Cleveland Wickliffe, Ohio, classifies the various types of material handling equipment Ohio, classifies the various in an effort to be of assistance to the industrial executive in planning his material handling system. The factors which must be taken into consideration in the planning of a material handling system are presented together with suggestions regarding the selection of the correct type of equipment. The folder is profusely illustrated with pictures of the various types of material handling systems and equipment in operation so that the reader may be guided in selecting the equipment which will most nearly fit his needs. Copy free to any mechanical executive upon request.

GREENFIELD SMALL TOOL CATALOG No. 35. The complete line of small tools made by Greenfield Tap & Die Corp., Greenfield, Mass., is presented in this 384-page catalog. Among the tools illustrated and described in this catalog are taps, dies, twist drills, screw extractors, reamers, gages, screw plates, pipe tools, and other tools made by this firm.

The book is illustrated throughout with photographs and drawings of all the different kinds of tools and gages, and the text explains the uses for which each tool is specifically adapted. Tables of sizes, specifications and prices are included.

A supplement at the rear of the book contains 72 pages of tables and general information for mechanical engineers and machine shop executives. Copy free to any mechanical engineer, plant engineer or machine shop executive.



They are still good! Still good for extra service. All they need is a thorough Oakite cleaning. Yes, even your dirtiest, oiliest, greasiest rags can be made like new . . . softer, more absorbent, more usable than ever . . . by low-cost Oakite laundering.

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Magnetic Relays: Bulletin 131 lists more than 100 relays for Heavy Duty to 25 amperes) on D.C. and A.C. circus These relays are particularly adapt for transfer purposes.

The bulletin gives valuable coil a contact data, contact arrangements, comensions and enclosures. Copy free addressing Ward Leonard Electric C Mount Vernon, New York.

Pyramid Mouldings. Pyramid Meta Company, 455 North Oakley Boulevan Chicago, Illinois, has recently issued new catalog showing a variety of Stai less Steel Snap-On Mouldings for u in industrial design.

This catalog is rich in suggestions f the use of Stainless Steel Mouldings decorative treatment on trucks, refrige ators, air-conditioned units, vendir machines, furniture and many oth items. Copies may be obtained by wri ing direct to the manufacturer.

Billings Drop Forged Tools. 39th Edition Catalog. This catalog, now bein issued by The Billings & Spencer Company, Hartford, Conn., contains 48 pages 8½x11 in. in size, describing and illus trating the complete line of engineers structural, machinists', automotive an other wrenches made by this firm, to gether with the Billings line of chiselic lamps, dogs, eye bolts, eye nuts, ham mers, hoist hooks, pliers, punches, ratch ets and parts, rod ends, screw drivers tongs, vises and other tools made by this firm. Copy of this catalog free upon request.

PRODUCTS. This 48-page book contained detailed descriptions and illustrations of insulation, packings, refractories, flooring roofing and siding, their friction materials, transite pipe, and other products of Johns-Manville, 22 East 40th Street New York, N. Y.

The sections which will be of interest to the metal-working plant executive are those which describe block and sheet insulation for heated surfaces, pipe insulation for high pressure heated steam lines, insulating cements, packings and gaskets, and high temperature insulating materials for use in the construction of industrial furnaces and ovens. Master mechanics in other industries than the metal-working industry will find special sections devoted to the different industries in which insulation materials are used.

Cechrane-Bly No. 14 Universal Vertical Miller-Shaper. A six-page folder which describes the No. 14 Universal Vertical Miller-Shaper made by Cochrane-Bly Company, Rochester, N. Y., is now being offered by that firm. The circular includes a list of the operations which can be performed on this machine and also a number of photographs showing various possible set-ups. Specifications for both duplex and single machines are given. Copy free upon request.

Sheffield Gages. This attractive 112-page catalog, now being distributed by Sheffield Gage Corporation, 1517 East and St., Dayton, Ohio, describes and illustrates the line of precision gages made by this firm. The text is divided into sections under the following headings: Terminology, Visual Gages, Installations, Thread Plugs and Rings, Thread Ring Gage Holder, Measuring Wires, Cylindrical Plugs and Rings, Tapered Gages, Setting Plugs and Rings, Adjustable Limit Gages, Adjustable Limits Gages, Adjustable Limits Plugs and Snaps, Special Gages, Strainometer, Thread Lead Tester, Vibrometer, and Engineering Data.

Copy of the catalog free upon request.

Johnson "Quality" Phosphor Bronze Bearings, Bushings and Bar Bronze. This 32-page book, now being issued by Johnson Bronze Company, New Castle, Pa, includes descriptions, illustrations and specifications of the phosphor bronze general purpose bearings and bushings, graphite bronze bearings, electric motor bearings, bronze bars, and babbitt which are included in the products of this firm. Copy free to any mechanical executive.

Building a Career in Arc Welding. The spectacular growth of the art of joining metals by means of the electric arc has developed a real and definite need for men who are versed in this phase of metal fabrication. To interest intelligent young men in the possibilities of arc welding as a career, The Lincoln Electric Company, Dept. E-359, Cleveland, Ohio, has brought out a 10-page book presenting the possibilities of arc welding and outlining a course of instruction which is available to applicants at the Lincoln Welding School which is conducted by the above firm. Anyone interested can obtain a copy of this book without charge by writing The Lincoln Electric Company at the above address.



M-D Facing Heads

With Automatic Feed
Can be attached to Column
Boring Bar, and Drilling or
Milling Machine spindles.
Single point tool travels
radially, from center outward or reverse, feeds automatically, and covers faces
6" to 30".

Write for circular.

MUMMERT-DIXON CO. 120 Philadelphia St. Hanover, Pa.





STURDIMATIC TOOL COMPANY

Write for Catalog and Free Trial Offer 5222 THIRD ST., DETROIT, MICHIGAN

Whitman & Barnes Decimal Equivalent and Tap Drill Size Chart. Illustrated herewith is a chart of decimal equivalent and tap drill sizes of wire gauge, letter and fractional size drills, which has been produced by Whitman & Barnes, 2108 Fort St., West., Detroit,

with figures ¼ in. and 3/16 im. height, making the chart clearly legisacross a good-sized room. The the board upon which the chart is printing insures against curling or easy darms ing. For protection the chart is exerced with cellophane and thus cam

cleaned or washed wit out damage to the si face.

One of these charts available, without chart to any mechanical exective or tool buyer or spervisor who has actuneed for a chart of the kind.

MINE SAFETY APPL ANCE COMPANY ISSUE AMMONIA MASK

Bulletin. A handsome ly colored bulletin describing the new MS Ammonia Masks for us in the servicing of ammonia refrigeratin equipment has just beer released by the Min Safety Appliances Company, Meade, Thomas and Braddock Ave., Pitts burgh Pa

burgh, Pa.

The new pamphlet contains actual photograph: showing the MSA Ammonia Mask in use, and is available by writing this magazine, or addressing the Mine Safety Appliances Company as above.

Handbook of Common Machine Fasteners. This 20-page booklet, now being issued by Russell. Burdsall & Ward Bolt & Nut Company, Port Chester, N. Y., has been designed to fit into the average drawing instrument case and was developed to be a part of

the draftsman's equipment. The booklet includes 26 illustrations of the latest accepted standard method of drawing various types of bolts, nuts and rivets. This data is said not to have been assembled before in any single publication. Copy free upon request.

Congress Standardized Drives. This four-page folder, now being issued by Congress Tool & Die Company. Inc.,

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This chart, 18½x25% inches and printed on %-inch board, free to mechanical executives or tool buyers.

Mich. The chart is printed in colors on a ¼-in. thick board perforated at the top for handing. The chart shows nominal and decimal dimensions of all standard drills of 1-in. diameter and under, including fractional sizes, letter size and wire size drills arranged in order of size. In addition, the chart shows National Standard tap drill sizes, both in fine and coarse thread.

The chart is 181/4 x25 1/4 in. in size,

9030 Lumpkin Ave., Detroit, Mich., contains illustrations, descriptions and tables of specifications for the grooved pulleys, variable speed pulleys, V-step cone pulleys, round belt pulleys, crown face pulleys, and flexible couplings made by this firm. Copy free upon request.

Effect of Wheel Speed on Polishing Performance. This publication, No. 2 of Volume 28 of "Grits and Grinds," is devoted to a discussion of the most efficient speeds at which to operate the modern high speed grinding wheels. The text comprises practically a report of the conclusions which have been arrived at after a considerable amount of research and experimentation both in the laboratories of the Norton Company A chart shows the and other places. total cost per unit of metal removed with the wheels operating at various speeds from 4500 to 9000 r.p.m Results of tests made for machine vibration at various speeds are also included. One page comprises a table of disc wheel recommendations in which the proper wheels are suggested for a wide variety of work on materials of various kinds including aluminum, brass, bronze, carbon, cast iron, steel forgings, dies, porcelain, rails, springs, and so on.

Illustrations include views taken from the polishing departments of various industries, general view of Norton Company Research Laboratories, special equipment used in making tests, drying ovens used in the research laboratory, different types of wheels mounted for operation, and so on. Copy free by addressing Norton Company, Worcester, Massachusetts.

Catalog No. 8 and Reference Manual of Apex Screw Drivers and Bits. This booklet, now being distributed by The Apex Machine & Tool Co., 501 East 3rd St., Dayton, Ohio, contains complete information on all types of power and spiral screw driver bits to fit the various makes of electric, air and spiral screw drivers. The catalog should be of interest to any user of Phillips' recessed head or slotted head screws.

Copy free to any mechanical executive who will address a request on his business letterhead.

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226

Forsberg Catalog No. 37 of "Whale" and "Viking" Tools. This catalog, now being issued by Forsberg Manufacturing Company, Bridgeport, Conn., is made up of a series of loose leaf bulletins describing the complete line of hack saw blades, metal band saws, hack saw frames, Thorite mallets, screw drivers, micrometers, and other tools made by this firm. All tools are illustrated and the text includes tables of specifications with prices. Copy free upon request.

Brac-Kit First-Aid Kit For Industrial Use

A new type of Brac-Kit, a first-aid kit designed especially for industrial use, has been developed by the Davis Emergency Equipment Company, Graybar Bldg., New York, N. Y.

A special feature of the Brac-Kit is that the kit containing the first-aid supplies is firmly locked, with a dustproof and water-proof seal, in an outer case, which can be permanently mounted This perin any convenient location. mits Brac-Kits to be located at various points in plants, offices, and warehouses, on service trucks and buses, and other places where first-aid may be needed. If an accident happens, no time is lost hunting for first-aid supplies. With a twist of the wrist, the kit is unlocked and withdrawn and its contents are available for instant use. If, after use, the kit is mislaid, its absence will be promptly noted.

The kit holds ten unit-cartons containing dressings and treatments which can be selected to meet any needs. Provision is made for a wire seal to prevent unauthorized removal of supplies.

Gear Design Simplified. By Franklin D. Jones, 134 pages, 8½ by 11 inches; 201 illustrations. Published by The Industrial Press, 148 Lafayette St., New

York City. Price, \$3.

This book consists exclusively of working rules, formulas, and data actually required by the designer and shop man in producing various types of gears. The theoretical side of gear design has been excluded, in order to condense and simplify the book. The types of gears dealt with include spur gears, internal gears, straight-tooth bevel gears, spiral-bevel gears, helical gears for parallel-shaft drives, helical (spiral) gears for angular drives, herringbone or double-helical gears, and worm-gears. There is also a section on the figuring of speeds and ratios, which includes various transmissions of the planetary type. At other section contains rules and form las for determining the power-transmiting capacities of different types

gears.

All gear problems are presented 1 simple chart form. Each problema showing clearly the dimension or angle required. Directly opposite this drawin is the rule (and equivalent formula) for determining that particular dimension angle, or other value. Then follows, 1 each case, an example showing exactly how the rule or formula is applied in practice. All gear problem throughout the book are presented in this way, and 201 drawings are used to illustrate the different classes of problems connected with the designing and cutting of gears. Whenever any problem has more than one solution of angle of approach, the different solutions are given, with the rules, formulas, and worked-out examples for each case.

This book explains the general application and advantages of different geartooth standards, such as the American standard 141/2-degree and 20-degree fulldepth involute systems; the American standard composite system; the different stub-tooth systems; and the standard module system employed in countries using the metric system of measure-ment. Tables of tooth parts covering a wide range of standard pitches give complete tooth dimensions for any diametral or circular pitch, including full-depth teeth and three stub-tooth There is also a table of standard (DIN) modules with equivalent diametral and circular pitches, as well as the important tooth dimensions.

The dimension, angle, or quantity represented by letters used in the formulas, or the notation, will be found at the beginning of the book, and the same notation is applied to all classes of gearing so that there is never any doubt as to the meaning of a given letter or symbol. The following list of section headings indicates the general scope of this new book: Gear-Tooth Standards; Spur Gears-Full-Depth Teeth; Spur Gears - Stub Teeth; Internal Gearing; Bevel Gears for Right-Angle Drives; Bevel Gears — Angular Drives; Straight-Tooth Bevel Gears — Gleason System; Spiral Bevel Gears—Gleason System; Bevel Gears of Parallel-Depth Type; Helical Gears; Herringbone Gears; Worm-Gearing; Worm-Gearing-Module System; Gearing Ratios and Speeds; and Power-Transmitting Capacity of Gearing.

Applications of Pullmore Clutches. This 24-page book, now being distributed by Rockford Drilling Machine Division, Borg-Warner Corporation, 113 Catherine St., Rockford, Ill., presents the application of the Pullmore Clutch in a wide range of industries and mechanisms. Beginning with a description of the dutch and an explanation of the construction details, the book consists principally of photographs of machine tools, street sweepers, book binding machines, locomotive cranes, industrial trucks, and other types of machinery, the fullest advantages of which are made possible by the use of multiple disc clutches. Drawings in blue print color aid in familiarizing the reader with the design of the clutch as applied in these various instances. Copy free upon request.

"A Ten-Year Record of Apprentice Training" written by Stanley M. Brah and published by International Correspondence Schools, Scranton, Pa., explains how 34 industries in one district pooled public and private resources for the common and the public good—to launch and conduct an effective apprenticeship training program. The book

gives the results of 10 years of experience by these 34 industries in six different cities in the operation of an apprentice training program in coordination with the International Correspondence Schools. The industries with which the apprentices were connected furnished the practical applications of the lessons and the lessons were supplied by the I. C. S. Mr. Brah explains in detail how the lessons were coordinated with the shop work under the direction of classroom supervisors selected and appointed by the manufacturers and sums up the results obtained by this coordination method.

An interesting point brought out by Mr. Brah is the fact that many of the apprentices who completed the course satisfactorily were working in shops which were too small to afford a regular apprentice instructor. A number of letters from public school superintendents, officials of manufacturers' associations and executives of metal manufacturing plants where the system outlined has been used indicate that it is highly satisfactory. A copy of this book can be had by addressing D. C. Vandercook, Director, Personnel Training Division, International Correspondence Schools, Scranton, Pennsylvania.

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Carboloy Standard Blanks. This 28-page catalog now being issued by Carboloy Co., Inc., 2975 E. Jefferson Ave., Detroit, Mich., contains complete information on the set of three standard styles of Carboloy blanks which has been developed by this firm. The blanks are available in 100 sizes and are said to be adaptable for use on more than 90 per cent of all common machining applications. Copy free to mechanical executives upon request.

Dardelet Self-Locking Bolt & Na Bulletin No. 16. This four-page bulletin, now being issued by Dardele Threadlock Corporation, 55 Liberty St New York, N. Y., describes and illustrates the design and application of the Dardelet Self-Locking Screw Thread and discusses the advantages, types, sizes and pitches, classes of fits and manufacturing tolerances, and economies of the type of thread. Copy free to mechanical executives upon request.

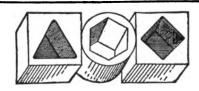
Wright Hoisting Equipment. One of the most complete catalogs on hoisting equipment that has ever been issued was recently announced by the Wright Manufacturing Division of American Chain & Cable Company, Inc., York, Pa. Engineers, materials handling men, shop superintendents and others in similar capacities will find this new publication a valuable addition to their files, as it is virtually a complete handbook on hoisting equipment.

In addition to complete specifications on Wright Hoists, Trolleys and Cranes, with special emphasis given to the Wright Improved Model High Speed Hoist, it includes suggestions on choosing a hoist as well as engineering tables on trolleys, cranes and I-beams. A special section is devoted to a description of Wright Electric Hoists. A new copy of this book will be supplied to those who use hoisting equipment.

Janette Blower Wheels Bulletin 24-2. This four-page bulletin presents a line of blower wheels for every application, now being manufactured by Janette Manufacturing Company, 550 W. Monroe St., Chicago, Ill. The wheels are designed specially for use in oil burners, coal stokers, gas burners, motorized

blowers, air conditioning equipment, and so on. Double inlet wheels are also available for slow speed applications.

available for slow speed applications. The features of the Janette blower wheels include scientifically curved steel blades which deliver a maximum volume of air with a minimum of noise, blade tips bent against the spring of the teel to insure tightness, blades made in pairs and welded to the back plate to insure the maximum strength, a rigid steel back plate, static balancing, baked aluminum finish on all wheels to resist corrosion. Copy of this bulletin free upon request.



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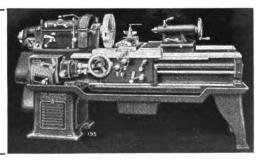
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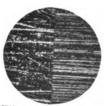
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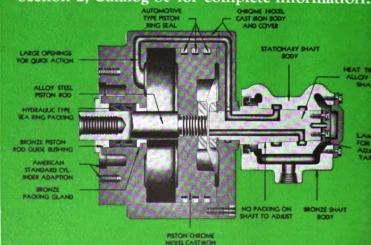
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OGANSPORT MACHINE INC., LOGANSPORT, I

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Mochine Shop

CINCINNATI, OHIO

August, 1937

Vol. 10, No. 3

High Speed Steel

The First of Three Articles on This Subject—Development of "Air-Hardening" Steels—Characteristics of Steels of Various Analyses.

By J. P. GILL

Chief Metallurgist, Vanadium-Alloys Steel Company, Latrobe, Pa.

In our modern production methods, high speed steel has an economic importance entirely out of proportion to the tonnage produced or of its monetary value. It has been aptly termed today's representative of the oldest known steels—namely, tool steels.

We sometimes forget that the earliest uses of steel were strictly for tool purposes and as such continued into the nineteenth century. That it is only since the Bessemer process dating from about 1860 and the open hearth dating from about 1868 that steels have been used widely for purposes other than for tools. In 1868 Robert Mushet noticed that one of his steel bars had become quite hard by cooling in air. Such a circumstance was astonishing and contrary to all previous experience.

An analysis of the bar showed that it contained a percentage of tungsten and probably considerable manganese. Mushet immediately began experimenting by melting hundreds of mixtures in a crucible and eventually developed a steel which possessed the property of becoming intensely hard by cooling in still air. The new steel was marketed under the name of "Robert Mushet's Special Steel" and imitations designated as "air" or "self-hardening" steels quickly followed. For the next twenty-five to thirty years it was practically the only tool steel in use.

The composition of the Mushet type of tool steels varied widely but an average would contain about 2.00 per cent carbon, 2.50 per cent manganese. 7.00 per cent tungsten, about 1.00 per cent silicon and sometimes up to .50 per cent chromium. Between 1890 and 1900 some manufacturers substituted chromium for manganese and during this time there were two distinct classes of the self-hardening steels marketed, namely, the tungsten-manganese and the tungstenchromium. Taylor and White began famous experiments Mushet and Self-Hardening Steels in 1894 for the purpose of determining which steels were best suited to special kinds of work. Their experiments led to the discovery of the use of a high temperature for quenching and also started the development of what we know as our present day high speed steels.

About 1902, the high speed steels were in use containing about .65 per

Let's review briefly the outstanding characteristics imparted by the several elements in the different types.

The carbon content of all high speed steels is of great importance, since with the tungsten and chromium remaining constant the hardness and toughness of the steel will vary in relationship with the carbon content.

The great mass of high speed steel tools that are manufactured from an 18-4-1 steel such as milling cutters, hobs. taps, broaches, drills, reamers, and so on, use the carbon range of from .67 to .75 per cent as this range seems to give the best combination of hardness, cutting ability and tough-

ness. If the carbon content is lowered in this steel the toughness is noticeably increased which is of importance for certain types of blanking dies, chasers, hot working dies, and so on, while if the carbon content is increased the steel has better cutting and wearing properties but will be slightly more brittle. For many types of tools such as lathe, shaper and planer tools, the higher carbon content is usually of advan-

The silicon content in all of the steels is not of particular importance so long as it is held within reasonable limits. Silicon is usually under about .35 per cent, but several of the steels have been manufactured with a silicon content as high as 1.00 per cent with no apparent detrimental results.

The manganese content is quite important since the manganese makes

TABLE 1

Steel	. c.	٧.	No.	Cr.	٧a.	Co.
A	.5575	18.00		4.00	1.00	
В	.6575	14.00		4.00	2.00	
C	.7585	18.50	.75	4,25	2,25	
D	1.10-1.30	18,50	1	4.25	4.00	
E	.7085	1.75	8.00	4.25	1.00	
7	.7085		8,50	4.25	2.25	
G	.7080	18.00		4.25	1.00	4.50
H	.7085	18,50		4.25	2.25	8,00
ī	.7085	14.00		4.25	2,25	7.00
7	.7585	21.00		4.25	2.25	12.50

cent carbon, 4.00 per cent chromium and 18.00 per cent tungsten. About 1907, the vanadium was added and in about 1912 cobalt was added. About 1915, due to the high price of tungsten, a high speed steel was marketed known as the 14-4-2 type or containing 14.00 per cent tungsten, 4.00 per cent chromium and 2.00 per cent vanadium. For the next ten years or until about 1925, there were only three general types of high speed steel; namely, the 18-4-1 type, the 14-4-2 and the cobalt type or 18-4-1 plus 5.00 per cent cobalt. 1925 many variations in the composition began to be introduced. Table No. 1 are given ten types of compositions that can be obtained commercially today, yet—surprisingly -last year between 80 and 85 per cent of all high speed steel produced was of the 18-4-1 type.

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the steel more sensitive to grain growth at the high temperatures and a high manganese content is likely to cause excessive breakage in treating. The manganese, therefore, should be held under .35 per cent.

In steel A the tungsten content of approximately 18.00 per cent is the result of years of experience, as it appears that something in the vicinity of 18.00 per cent combines to best advantage the wearing properties or cutting ability and toughness. If the tungsten content is increased materially over 18.00 per cent there is an increase in cutting ability and wear resistance with a sacrifice of toughness. By decreasing the tungsten content materially under 18.00 per cent some toughness is gained, wearing ability is decreased and the steel becomes more susceptible to grain growth at the high temperatures. Therefore, in steel A about 18.00 per cent tungsten is considered the best balance between cutting ability and toughness.

In all of the steels the chromium content is something in the vicinity of 4.00 per cent, which amount is again the result of the knowledge gained from many years of experience and applications. Decreasing the chromium content under 4.00 per cent decreases the hardenability of the steel and increases the toughness. Some cutting ability is sacrificed as the chromium content is lowered. Increasing the chromium content over about 4.00 per cent increases the hardenability of the steel, increases its wear resistance or cutting ability and noticeably increases the brittleness. It will be noticed that the chromium content is within comparatively narrow limits, being between 3.75 per cent and 4.50 per cent, for all the steels listed.

The element vanadium adds increased cutting efficiency to High Speed Steel, the exact cause of which does not appear to be wholly explainable. It may be partially due to the fact that vanadium carbides are quite stable at elevated temperatures and also to the fact that vanadium apparently gives some better distribution of the segregate. Nevertheless, it is a proven fact that the cutting efficiency of all of the steels will increase with an increase in vanadium up to at least 2.50 per cent. increase in vanadium it appears necessary to increase the carbon content to maintain sufficient hardenability.

Increasing the vanadium also seems to add forgeability to the steel, and 18.00 per cent tungsten High Steel can be successfully forged with a carbon content as high as 1.50 per cent with the vanadium content from 3.50 to 5.00 per cent. Some high speed steels have been made of such a composition and have shown some unusual results. 18-4-2 type (Steel C) is based on the increased efficiency of vanadium. Since this steel is usually a cutting steel, the carbon content is generally from .75 to .85 per cent and it does not appear to be quite as brittle as does the 18-4-1 type with the same carbon range. Steel C has made such a good enough account of itself during the last several years that it is becoming of considerable wider usage.

Steel B, known as the 14-4-2 type of High Speed Steel, has a cutting efficiency that compares favorably with the 18-4-1 type, and some authorities even claim that on roughing or heavy cuts it is superior to the 18-4-1 type. It has won the Philadelphia Navy Yard test for at least fifteen years. Steel B is noticeably more sensitive to grain growth on heat treatment, making it somewhat more difficult to manufacture uniformly and also requiring greater care in treatment. The fact that it is not as fool proof as the 18-4-1 type has apparently reacted against its use so that at the present time it is in much less general usage than it was about fifteen years ago.

Steel D is somewhat unusual because of its very high carbon and high vanadium contents. It has remarkable wearing properties, far in excess of any ferrous material we have ever tested.

Steels E and F are essentially the result of efforts to improve upon a molybdenum high speed steel of the nature investigated and reported by the Watertown Arsenal several years ago. Steel E was described and discussed by Emmons at the Buffalo Convention in 1932 and during the last several years has received a great amount of attention and discussion.

Investigations made of steel E in a number of instances indicate that the small tungsten content is of substantially no value and that the characteristics of the steel are materially no different than that reported on by the Watertown Arsenal. The denum high speed steels are definitely improved by increasing the vanadium content, as a result of which we have steel F. In cutting ability these steels compare favorably with 18.00 per cent tungsten high speed steel when used on soft materials or at speeds and feeds such that the temperature generated at the cutting point remains noticeably less than that for an 18.00 per cent tungsten high speed steel. On hard materials or at high speeds and feeds where the temperature of the cutting edge is increased it does not then compare favorably in cutting ability with an 18.00 per cent tungsten high speed steel. There are many operations on which high speed steel tools are used where the temperature of the cutting edge never becomes sufficiently high to cause the ultimate failure of the tool, in which case the type of high speed steel gives the best account of itself. The molybdenum steels have other characteristics, such as susceptibility to grain growth and tendency toward decarburization, that make them more treacherous to handle than an 18.00 per cent tungsten high speed steel.

Upon delving into the reasons why high speed steel cuts, it would appear that the hard carbides which are imbedded in the softer matrix are of great importance. Tungsten carbide being so much harder than molybdenum carbide, it would seem that tungsten would impart better wearing properties than molybdenum.

Cobalt is the only element, other than vanadium, that has been added to the composition of high speed steels since the inception which has withstood the test of time. elements have been tried, such uranium and tantalum, and some steels have been marketed with The cobalt high uranium content. speed steels are a definite type, yet have most of the essential characteristics of the 18-4-1 type of high speed steels.

The cobalt high speed steels are of comparatively restricted usage, although they are quite valuable when properly applied. The cutting ability of these steels with the carbon, tungsten, chromium an I vanadium content is somewhat proportional to the cobalt content up to about 12.00 or 13.00 per cent cobalt. As the cobalt content increases it seems desirable to increase the carbon in order to retain comparative hardenability.

Steel G is the simplest of the cobalt bearing steels, being essentially an 18-4-1 steel plus about 4.50 per cent cobalt. Steel H contains in addition to the cobalt content, about 2.00 per cent vanadium. Steel J is the most highly alloyed, containing a tungsten content as high as 21.00 per cent, a vanadium content as high as 2.25 per cent and a cobalt content as high as



Upper Picture . . . Model-3K Universal Milwaukee Milling Machine.

Below . . . Hypoid Type Spiral Universal Dividing Head-5 to 1 ratio-for exacting work of toolroom and experimental laboratory.

chines — one, the apparent accuracy of the idle machine on the test floor - the other, the actual accuracy when the machine is under working loads ... This performance accuracy in all K & T Milwaukee Milling Machines is the result of sound design translated into metal by skilled workmanship . . . Ask your nearest K & T Milwaukee representative about performance accuracy in Milwaukee Milling Machines - or write for information.

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13.00 per cent. Steel J, when manufactured with a carbon content of .80 per cent, contains about the maximum amount of the alloys used in high speed steel that can be added and still keep the steel commercially forgeable.

Steel I differs essentially from the other three steels in that the tungsten content is only from 12.00 to 15.00 per cent. All of the cobalt steels may or may not contain a small amount of molybdenum. It is somewhat difficult to make comparisons of the cutting ability of the four types of steels but, in general, production records indicate that their cutting ability is about directly proportional to their alloy content.

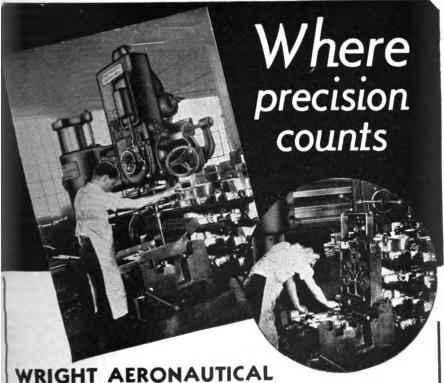
Cobalt high speed steels retain many of the characteristics of the non-cobalt types, yet when the compositions of the steel are the same with the exception of the cobalt content, the steels are definitely more Cobalt high speed steels harden with a finer grain and are considerably more subject to cracking during hardening, particularly large sections. These steels highly subject to a soft skin or soft surface in the hardened condition. This characteristic is caused by a partial decarburization of the surface during the heating operation for hardening, the depth and degree of the partial decarburization being directly proportional to the cobalt content when other factors are equal. The cobalt high speed steels are usually less susceptible to grain growth than the non-cobalt types and, consequently, can be heat treated from somewhat higher temperatures.

In the composition of high speed steels there are likely to be found elements not found in many other types of steels, such elements being introduced through contamination of the tungsten or scrap. These elements are most likely to be copper, tin, antimony, arsenic and nicked Copper in small amounts apparent does not affect the steel noticeable although in larger amounts it may make the steel "hot short". The copper content can safely be up to about 25 per cent (possibly higher) whill it requires a copper content as high as .75 per cent before the steel becomes noticeably "hot short".

Tin causes some embrittlement ar seems to affect the cutting ability the steel, causing the cutting edge fail prematurely. This characterist is distinctly noticeable at about .4 to .50 per cent. Therefore the ti content should best be kept under .1 per cent. Arsenic and antimony seen to combine the bad effects of bot sulphur and phosphorus, making th steel difficult to hot work and making it exceedingly brittle when cold. Con sequently the combined contents o arsenic and antimony should best be kept under .10 per cent.

Nickel in small amounts causes the steel to show a soft "skin" when hardened; this characteristic being distinctly noticeable at .25 per cent. In large amounts it prevents the steel being softened in the anneal, so that at 2.50 per cent nickel in steel A, the minimum hardness on annealing is about 350 Brinell. It makes the steel harder at elevated temperatures and tends to prevent softening on tempering, particularly above 1100 degrees Fahrenheit. In general, the nickel content should be less than .15 per cent.

Cleco B1 Scaling Tool Bulletin 84. This four-page folder, now being distributed by The Cleveland Pneumatic Tool Company, 3734 East 78th St., Cleveland, Ohio, describes and illustrates the Cleco B1 Scaling Tool. This tool is said to be ideal for general scaling, peining, and beading, for cleaning off rust and old paint, and for removing weld splatter and excess metal in production welding. Copy of the folder free upon request.



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THE CINCINNATI BICKFORD TOOL CO.

Special Tools in the Southern Railway Atlanta Shops

BY HOWARD CAMPBELL

THE equipment in the Atlanta shops of the Southern Railway includes, besides the standard machine tools which are common to every railroad shop, a number of pieces of equipment which have been developed by the executives and workmen in this shop. One of these is a pneumatic rivet cutter with which rivets can be cut to any length desired by the use of pneumatic power. The rivet cutter, shown in Fig. 1, consists primarily of a frame upon which an air brake cylinder is mounted vertically, as shown in the illustration.

One end of the shear blade is hinged to the piston rod of the air cylinder and the other end is pivoted to a vertical plate which contains six holes plate and the shear blade are of hardened steel. The holes are of a size that will admit ½, %, ¾, %, 1, and 1¼-in. rivets. Holes are also provided in the shear blade so that a rivet of any of the above mentioned sizes can be cut by inserting it into the corresponding hole and opening the air valve.

The frame is 10x3-in. channel iron and the cylinder is a 10x12-in. air

on a 6-in. circle. Both the vertical

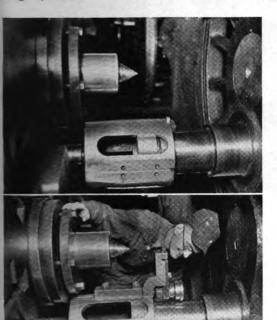
The frame is 10x3-in. channel iron and the cylinder is a 10x12-in. air brake cylinder. The blades are of carbon tool steel, hardened and ground. The lever end of the blade is maintained in proper alignment by the use of a vertical guide made of welded bar stock, bolted to the base. A heavy spring at the top of the guide limits

the movement of the lever. The machine is mounted on three wheels so that it can be moved about the shop as required.

Pins on driving wheels are turned with the aid of the special pin turning tool shown in Fig. 2. The tool is of the box tool type, the housing being 14 in. long and made from 1½-in. stock, formed to the shape shown. A bronze split ring threaded on the outside is slipped on to the crank arm fit and a key is inserted



Fig. 1—Portable pneumatic rivet cutter with which six different sizes of rivets can be cut.



through the split and through the bolt hole to prevent the ring from turning. A cast iron ring threaded on the inside and turned to a slip-fit for the inside diameter of the box tool is

screwed onto the bronze ring to serve as a pilot for the box tool. The cutter is a 5%-in. toolbit, positioned in a square slot at the front end of the box and held in position by a small clamp, as shown in the illustration.

By the use of this tool the crank pin on a driving wheel can be turned without removing the

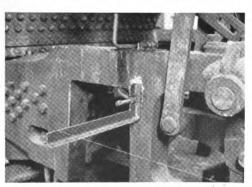
Fig. 4—Bracket holding one end of line for testing alignment of a locomotive frame.

Fig. 2—(Above)—Crank pins are turned with the aid of this turning tool without removing them from the driving wheels. Fig. 3 (Below)—After turning, the crank pin is rolled with this double roller rolling tool.

pin from the wheel. Removing a crank pin from its seat usually enlarges the crank pin fit; consequently, by turning the pin in this manner the solid anchorage of the pin is not disturbed.

When the crank pin has been turned to a size suitable for rolling, it is rolled with a box tool equipped with a pair of rollers as shown in Fig. 3. The frame or housing of this tool is of the same material and the same type of construction as the turning tool described in the preceding paragraph, with the exception that this tool is equipped with two brackets, each having a square channel which serves as a holder for

the shank of a rolling tool. The shank is slotted longitudinally to provide for adjustment and is held to the bracket by means of a capscrew. The necessary fine adjustment is obtained by



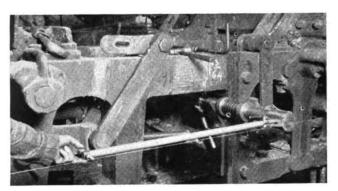


Fig. 5—By swinging this arm first toward one end of the frame and then toward the other, the alignment of the frame is easily determined.

the use of a setscrew in the end of the bracket. The rollers are of the usual type. Inasmuch as the shank of the tool fits into the same spindle as the turning tool previously described, it is obvious that the rollers must roll the pin evenly.

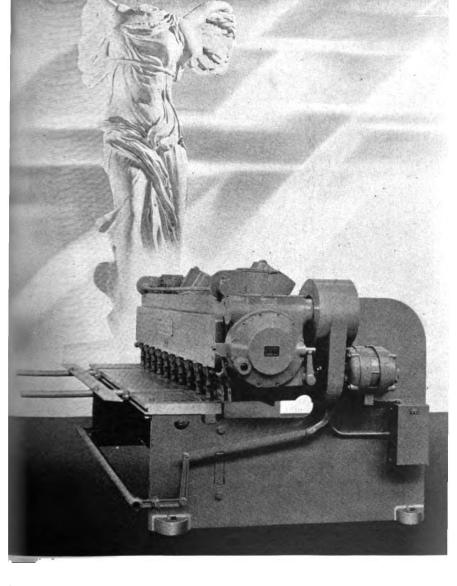
The engine frame is checked for alignment by the use of a small but effective device, illustrated in Figs. 4 and 5. A bracket similar to the one shown in Fig. 4 is bolted to each end of the frame and a line is strung between. The brackets are bent to an exact angle of 45 deg. and each bracket has a slot cut into it at exactly 18 in, from the face which contacts with the frame; thus the line is exactly the same distance from the frame at each end. To check the alignment with the frame, a spindle carrying an arm as shown in Fig. 5 is locked in position on the underside of the frame by the use of brackets as shown. In the end of the arm is a stud which can be adjusted so that it will just touch the line. By swinging the arm first in one direction and then the other and noting the distance, if any, of the stud from the line at each end, the exact amount of misalignment of the frame can be determined.

The illustration Fig. 6 shows the method that is used in these shops to remove driving boxes from locomotive axles. The bolts that hold the cellar to the box are removed, then the links in the ends of the two chains are hooked over the grease plate studs and a vertical pull is exerted

by the crane. The task of loosening and removing the box, which ordinar-



Fig. 6—The power of the electric crane is applied to remove the driving box from the wheel axle.



A mechine tool for shearing metal. The Cincinnati Shear res won high praise from all who use it and from those who rave seen it demonstrated. All-steel construction, accurate, fast, with new gauging methods . . . its very appearance expresses efficiency.

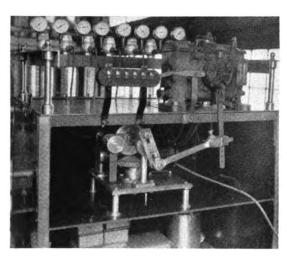


Fig. 7-Mechanized lubricator tester.

ily is one upon which more brawn than brains is used, is easily accomplished by applying the power of the electric crane.

Lubricators that have been over-

hauled are tested b the use of the testin outfit shown in Fig. ' This outfit comprises box made of angle iro and sheet metal with shelf to serve as a sur port for a quarter horse power motor and a work drive. On the top of th box is mounted a bracke carrying eight gages an eight tubes which carry the oil to the lubricator Power to operate the lub shaft is trans mitted by means of a disc the rim of which rides or the face of the worn This disc can be moved back and forth or the face of the wheel and

allowed to operate continuously at any position desired. As the position is changed, of course, the speed is changed; thus any speed required for testing the lubricator can be obtained.

Keller Cutter and Radius Grinder Bulletin. This eight-page bulletin published by Pratt & Whitney Company, Hartford, Conn., and printed in colors, presents the features and advantages of the Keller Cutter and Radius Grinder. In developing this machine, the designing engineers have kept in mind the fact that the production machine is no better than its cutter and the objective has been to design this machine so that all kinds and types of milling cutters, end mills, routing tools, die sinking tools, and other special tools may be sharpened correctly. The machine is particularly designed to grind straight or tapered flutes and to finish the ends of cutters to accurate radii, leaving the tutter to work cleanly and smoothly at high speeds.

The bulletin illustrates each individual part of the machine and describes its manufacture and operation in detail. One page is devoted to a series of pictures showing the various steps in the setting up and sharpening of a spiral cutter, the pictures being accompanied by explanatory text. Specifications are

included together with a descriptive list of additional equipment that is available. Copy free upon request.

Vascoloy-Ramet Catalogue. Standard sizes and styles of hard carbide tool blanks have been adopted by the hard carbide industry as of July 1937. By the selection of about 100 sizes of carbide blanks for tool tips, made in three styles of shapes, the industry expects to effect economies in manufacture and distribution which have been reflected in price reductions for these standard blanks. Likewise tools made from these standard blanks have likewise been repriced.

The Vanadium-Alloys Steel Company announces the publication of a new catalogue of tools and blanks, containing much useful data for tool makers using carbide blanks, or machine shops using tools tipped with these blanks. Copies may be obtained by application to the Vanadium-Alloys Steel Company. Vascoloy-Ramet Division, North Chicago, Illinois, or any of its offices.

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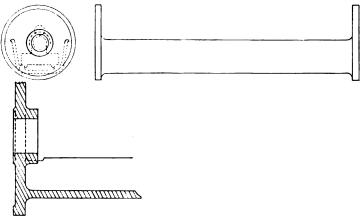
Boring Long Holes in Frame of Recoil Mechanism of 75mm French Guns

BY A. L. DE LEEUW

Consulting Engineer

I N a previous article I described the lapping of the two main holes in the main frame of the recuperator, or recoil mechanism, of the 75 mm French gun. The rapidity of that operation and the uniformly good results were made possible, in part at least, by the fact that the boring operations had made holes that were straight as to axis and of uniform and correct size. The amount of metal to be removed by lapping was from 0.0025 to 0.003 of an inch. This amount was kept uniform so that there were no appreciable differences in the time required for the lapping of the different frames.

These frames came to us as rough forgings, and the term "rough" applied with peculiar significance to When the original estimate was made as to cost and time required. the expectation was that these forgings would weigh about 950 lbs. As a matter of fact, they weighed 1350 lbs., and, at that, some of them lacked sufficient stock in some places and consequently could not be worked up. Many others came so close to being useless that the greatest care had to be taken in the lay-out. Some of these forgings were bent, others had much stock on one side and not enough on the other one. The problem of



Outline Drawing of Cradle for Boring Holes in Frame of Recoil Mechanism of 75 mm Gun.

lay-out was so serious that it was decided to build a special machine for that purpose.

In this machine the forging was laid in a cradle which could be moved up and down in the direction of the axis of the forging; that is, it could be rocked in that direction. It could also be rocked in the other two main directions. This cradle was located in a bed, a lathe bed being used for that purpose. The ends of the cradle were turned as shown in the drawing, the approximately 24 in. being diameter. One end rested in a split cast iron ring attached to the faceplate of the lathe: the other end in a similar cast iron ring held in the steadyrest.

When the cradle had been rocked to such a position that there was stock for the various operations at all points, it was locked in position by clamps furnished in the machine for that purpose. If it was found impossible to adjust the cradle so that stock would be available for removal on all sides, the forging was rejected. It may sound rather strange that this ever should be the case when one considers that the rough forging weighed 1350 lbs. and that it weighed only 215 lbs. when completely finished. Nevertheless, a number of forgings had to be rejected.

There were two brackets, slideably mounted on the ways of the bed, one in front and one in the rear. Each of these brackets had a number of pins that could slide in them. Each pin was provided with a handle for manipulation. Some pins would slide horizontally and some vertically. The pins were supposed to strike the forgings when they were manoeuvered. If they were free to move without striking, this was proof that there was not enough stock at that point. Of course, the pins were located in the brackets to correspond to the cross

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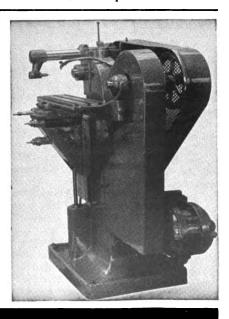
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section of the finished work.

That a pin could be moved without striking was no proof that the forging was defective. It showed only that it could not be used if it were operated upon in the position in which it was lying in the machine. The cradle was then moved so as to correct its position in relation to that particular pin. Sliding the brackets inch by inch along the bed, and manipulating the different pins, it was possible to find in a very short time whether the forging could be used or not.

Good forgings required about fifteen minutes for this examination. Bad ones took longer, for it would take considerable care and time before one could be sure as to their uselessness. At first, such forgings were laid aside for further examination without spending too much time on them for speed was an essential. As soon as there were enough good forgings so that operations could begin and continue for some time, the ones that were laid aside were subjected to a more careful examination.

The usual method of lay-out is to scribe lines on the object to be ma-The method followed with chined. these forgings was a different one. A special drill head was located at each end of the machine bed. Each head had two spindles. When the forging had been so located that in that position there would be stock for all operations, the cradle would be clamped and the drill heads set to work. Each head would drill two 14-in. holes in the end of the forging. These holes were the gage points for the first This operation consisted operation. in planing two parallel strips, and these strips were, thereafter, the gage points for all subsequent operations.

The entire operation, up to and including the drilling of the holes, required about twenty minutes. A few of the forgings had been laid out by hand before the machine was ready.

This hand operation took about twenty four hours and the service of a very skillful and careful man.

As a matter of course, the forgings were completely roughed out before the boring of the holes began. These holes, it will be remembered, were 63 inches long. The diameter of one was 1-9/16 in. and that of the other 2½ in. As a matter of fact, the dimensions were given in millimeters. but for a general consideration of the problem the dimensions as given here are sufficiently close. Fearing that the drilling of the holes might affect some of the dimensions in other places. some metal was left here and there for a final finish. However, it was found that this precaution was not Unimportant operations necessary. only were done after the boring of the holes.

After the preceding operations had been completed, there was only a thin wall left around the holes, so that the first drilling had to be accurate. Once the holes had departed from their proper directions, corrections were not practical unless the errors were small.

The French method consisted in drilling a hole half way through, then reversing the forging and drilling the other half. The method was also followed by Rock Island Arsenal, so it was reported to me, except that a duplex machine was used, drilling both halves of the holes in one operation. In either case, the drills revolved and the piece of work was stationary.

Our method was different, because it was realized that it is not possible to control the direction of a drill. As a matter of fact, it was found in the French arsenals that the two halves of a hole did not always meet and that, sometimes, a drill would break through the wall of a hole. This was though the wall of a hole. This was to be expected, considering that there may be soft or hard spots in the forging, and that such spots would deflect the drill. Moreover, to make



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sure that there would be enough me at all points for the subsequent realing operations, more metal would hat to be left for this reaming than would be necessary if one could be sure that the two halves of the hole would me centrally. To overcome these diculties, the following method was us

The machines used for the drilli operations were lathes with long be Fixtures were built in which the for ings could be laid. There were, course, the necessary devices to pla and hold, the forgings in the proj position. Each fixture was turned both ends and the center of such turned part was the same as the c ter of the hole to be drilled when forging was in the fixture. The f plate of the lathe was provided w a cast iron ring in which the tur part of the fixture would fit. steady rest of the machine was a provided with a cast iron ring stead of the standard three is Each lathe was further provided v an individually driven boring head.

The principle underlying our met of boring is this, that the axis the hole will be straight and that cross section will be truly round both piece and drill revolve. This only one thing that may or may be right when this method is ployed. The hole may not be of ediameter. It may be tapered with large diameter at the far end of hole.

So as to minimize the effect this fault, only half the length of hole was drilled at one setting, a which the fixture was turned end end and the other half was dril Another reason why the holes was totherwise, the length of the lewould become excessive. It was for invariably that the two halves of hole met centrally and, though the was often some taper, this amount of a few thousandths at the most

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there were three reaming operations to follow, this slight taper did not affect the final result. Incidentally, it may be mentioned here that this tendency to make a taper hole can be used to advantage in some cases, and that the writer has made some interesting applications of this fact.

It is hardly necessary to point out that each of the two holes required its own fixture, for the drilled hole must be central with the spindle of the

lathe.

The drilling was done with a special twist drill. It was an oil drill, but no oil was introduced through the center of the drill, nor along the tube provided for that purpose; neither did the oil find its way out along the clearance surface of the drill. Quite the opposite took place. The oil was introduced along the clearance surface of the drill and oil and chips found their way out through the cen-Oil was provided under a pressure of 300 lbs. to the square inch. It would, perhaps, be better that the final pressure was of that amount, for so long as the oil could freely run out of the hole, the pressure was, of course, much less. However, that pressure would begin to build up as soon as the chips began to choke the hole in the drill, and it was not until that pressure had reached the amount stated that the chips were ejected.

Attached to the drill was a long hollow bar which was revolved by the mechanism of the boring head. A bushing was fitted in the end of the fixture and tight against the end of the work piece. Drill and boring bar fitted the hole in that bushing. It was through this bushing that the oil was introduced. As will be seen from this description, the oil entered the hole along the clearance surface of the drill. A short length of the hole was drilled before the bushing was placed tight against the work. As soon as this preparatory hole was

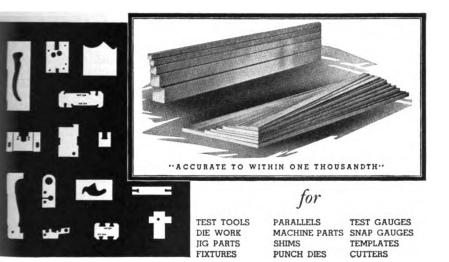
long enough, the actual work of driliing began. The oil would lubricate and cool the very ends of the cutting lips of the drill. The chips would find a passage through the center.

So as to minimize the friction between chips and drill, the throat of the tool was nicely polished. As more and more chips tried to escape through the hollow drill and the long boring bar, there ensued a clogging up of the hollow bar and the pressure of the oil began to build up. When a pressure of about 300 lbs. was reached, a wad of chips was forcibly ejected and the process began anew. A feed of 1½ in. per minute was obtained.

The smaller of the two holes was 1-9/16 in. in diameter and the drilled hole 14 in., thus allowing ample stock for the various reaming opera-The reason why this large amount of stock was left was that, at the time tools and fixtures were designed and made, there was no absolute certainty that the drilled holes would be as perfect as they actually proved to be. The expectation was that these holes would be in line and of the proper cross section, but there was no previous experience to bank on. If the high expectations we had were not realized, then we would have to design and make new tools. unless there was enough stock left to meet all contingencies. This would mean loss of time and at that period time was of the first importance. decided, therefore, to enough stock after the drilling operations to be safe, even if the proposed method of drilling should not give as good results as we expected.

There were three reaming operations. The tools for the first two were what are called "wood reamers." Though not commonly used in the average machine shop, this type of reamer is well known in arsenals and other places where artillery is made. The cutting tool, itself, is a straight AVE TIME • SAVE TROUBLE • SAVE MONEY

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blade, mounted on a piece of wood. This wood support is of cylindrical shape. Part of this cylinder is cut away, so that the blade can be mounted on a flat surface. The wood part of the tool fits closely in the finished hole, so that the tool is its own guide. The blade acts as a boring and also as a scraping tool. Though the operation goes by the name of reaming, it is really a boring operation.

The wood part of the reamer must be soaked in oil to facilitate its passage through the hole. It is a very simple matter to make oil penetrate into wood. All that is necessary is to let the wood lie in the oil for a sufficient length of time, but time is at a premium when there is war. It was not possible for us to let the wood soak for several months before using it, and so some other way had to be devised.

Several schemes were tried, one of which called for laying the pieces of

wood in oil in a closed vessel i which compressed air could be mitted. This did not work out as sired. As a matter of fact, it was a tried because it was felt that not should be left untried. And scheme, and one that was somet more successful, consisted in some the wood in hot oil. However, depth of penetration was not section.

The final, and successful schl was the combination of hot oil are partial vacuum. The vacuum applied first, and after some that oil was admitted under ordin pressure. The vacuum removed s of the occluded air and some mois and made, so to say, room for the It might be asked why an oily sur of the wood should not be suffice that the reamer must penetral long distance into the work and it leaves some oil behind as it.

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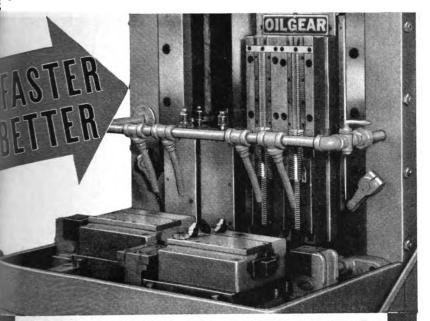
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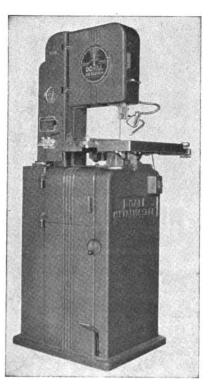
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gresses. There must be a reserved of oil in the wood, for it does no goo to pour oil in the hole while the cu is on. This may do some good to the cutting tool itself, but not to the wood part, for this is squeezed tights in the hole.

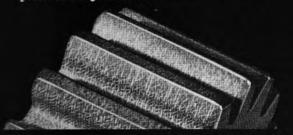
The reason why two reaming operation tions were necessary with wood rear ers is that a considerable amount d metal had to be removed, and that th tool was liable to lose its size during its passage through the hole. As th second reamer removed only a small amount of stock, there could not b much wear of this tool and it migh be expected that the hole would b of even size throughout after this see ond reaming operation. However there was a possibility that the axi of the hole was no longer a straigh line due to the action of the woo It is true that the clos fit of the wood part tends to guide th cutting blade, and that, in theory the reamed hole should be as straigh as the drill had made it, but, is reality, slight variations in the condi tion of the metal may deflect the tool especially so as that tool is pushed through. Pushing it through mean pressure in the long bar holding the reamer, and this means deflection of the bar and a consequent tendency to steer the tool in the wrong direction It was, therefore, decided to follow up with a third reaming operation in which the reamer was pulled, and not pushed, through. This pulling has a tendency to straighten the hole. Of course, very little metal was removed in this last operation, so that there was no danger that the tools would wear appreciably during a single passage.

It is just possible that greater precautions were taken than were absolutely necessary, just as it may be possible that we might have started with a larger drill. However, the

(Continued on page 84)

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Modern Methods of Packing Machine Tools for Shipment

By Francis A. Westbrook

THE machine tools which comprise a part of the product of the Brown & Sharpe Company, Providence, R. I., are shipped to all parts of the world, consequently this firm has found it necessary to develop methods of packing which will insure the safe arrival of the tools under the most adverse conditions.

The various types of machines must be handled in the manner best adapted to the design, but in the course of years certain fundamental principles have been evolved which can be applied in the packing and crating of machines of all types. To ensure the proper application of these principles, the workmen in the crating department have been especially trained for this work and the operations in the department have been standardized as far as practicable.

Before discussing the crating methods, it may be interesting to consider certain aspects of the organization of the department. One feature consists in that the crew is largely divided into groups consisting of specialists of certain types of the work. Some of the men are specialists on crating milling machines, others on gear cutters, grinders, screw machines, and so on. Some men pack only attachments. Others make only the platforms and sides of the cases.

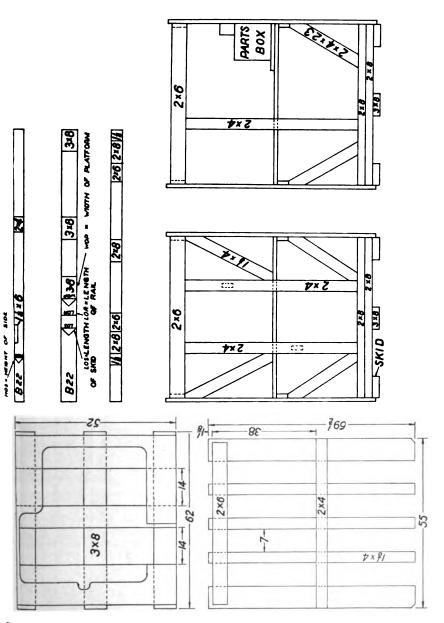
Of course, the workers are interchanged a great deal, but there is always at least one experienced man to serve as leader of any packing crew.

Standard designs have been worked

out for the platforms and sides the crates for each type of machi tool. Platforms and sides for crafor milling machines, gear cutters a grinders are of the same design, though of different sizes accordi to the machine sizes. Screw machine vary considerably in design, cons quently the boxes usually have to built around them. However, expe ence has taught the specialists on th job to gauge the requirements of t task without delay or difficulty. T moveable parts and tools which a company each machine are packed excelsior in standard boxes which a anchored in the crate so that ever thing pertaining to any one machiwill be enclosed in one container.

As orders are received by the sal department for machines, a list the machines that are sold is sent the shipping department, togeth with shipping instructions, so that the shipping department foreman can planis work and have the parts of the boxes and crates made up ahead are thus be ready to proceed with packing as soon as the machine is delivered to the crating department.

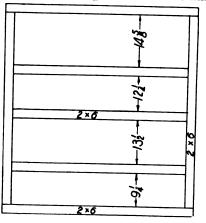
Platforms and sides of cases for standard machines are constructed according to measurements marked of on wood strips known as "sticks." On stick will carry all the measurement for one type and size of machine, and there are sticks for all types are sizes. Thus all measurements are easily obtained without the use or rules and the possibility of error is reduced to the minimum.

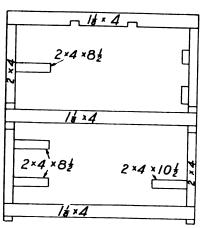


7c. I—Drawing illustrating use of "sticks" for marking off packing case parts and sections.

The drawing Fig. 1 shows how the measurements are marked off on the sticks, the measurements shown in this case being those for a No. 22 milling machine case. The series of diagrams in Fig. 2 show how the case is constructed. The illustration is practically self-explanatory, but it may be useful to point out some of the principles upon which the case is designed and what it is intended to accomplish.

First, the design must be such that





the machine tool cannot move in case. This is accomplished by an ing blocks at strategic points in case so that the machine cannot or tip. The blocks must be so ranged that no matter what post the case may be in—even upside o—the machine will be adequately ported so that no parts can be but or sprung.

The platform is reinforced the heaviest sections of the mand and wood rails are built in to provide anchorage for the machine sides. There are three points if end of the case where 1½-in. sections are used to provide strand rigidity and to act as shood sorbers as, for instance, where freight train or truck comes studden stop.

The construction of the top of case is very important, due to strain placed upon it by the correction or cables used to hoist the material aboard cars or boats. The top is lined with 1½x5-in. stock enough cross members to procrushing. This reinforcement is quate for machines weighing fro 2½ tons. Machines weighing 2½ to 8 tons must have top lines.

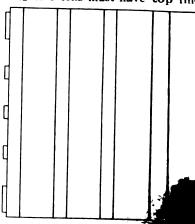


Fig. 2—Diagram illustrating construction of packing case



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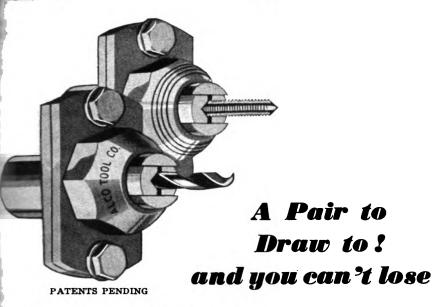
Engineered POWER TOOLS

2x6 or 2x8-in. material. These cautions are necessary due to the that, although the cases may marked "Sling Here", stevedore not always pay attention to such tices. Experience has shown that better to take no chances of dan

As stated above, small parts tools are placed in boxes which anchored in the case. Some of larger parts are merely blocked if this can be done so that they not shift about in transit. Sheet paper are placed between pai parts and the walls of the case to vent marring the finish of the chine. Waterproof burlap covering provided over the top of the mac and when cases are to be expor the waterproof covering is prov for the entire interior of the When shipments are to be made truck, the packing may be less e orate but in such instances wa proof bags are placed over the chines to protect them from moist

Particular attention has been g to the prevention of rusting du transit. One of the preventive m ures consists in covering all unpair parts of the machine with a slus! compound which was developed the purpose in cooperation with ar company. Two formulas are u one a light compound for use w the machines are to be shipped to jacent points in New England New York, the other a dark, hear compound which is applied when shipments are to be made by water for long distances. The compounds easily removed with naphtha or ke sene, and all trouble from rust been eliminated.

The effectiveness of the compoureferred to is illustrated by sever actual experiences in which the richines might have been ruined if leffective means of protection had be employed. For instance, at the ti



You can't afford to gamble in your business; but, when you equip your screw machines with ALCO Drill Chucks and ALCO Tap Holders, you arn't gambling. You are playing a sure thing, for these new tools have already demonstrated, in actual service, that they are the biggest money savers in the way of screw machine accessories developed in many years.

To quote from one manufacturer.... name on request.... and, incidentally, one of the largest industrial units in the country, "The cost of the tool was saved in twenty-two set-ups made during two weeks and two days of actual operation." Positive setting, absolute concentricity and simplicity of adjustment, with the elimination of the necessity for bushings, made this possible. You, too, can effect this economy. Further, you can forget the worries you have always had about bushings.

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of the Dayton, Ohio, flood, several milling machines were under water for a week but suffered practically no damage. In another case a grinder being loaded onto a steamship was accidentally dropped into the water of the harbor and stayed there two days before is was recovered. Examination showed that the machine was undamaged except for the painted surfaces where no compound had been applied. These surfaces were, or course, easily repainted.

Great care is also taken to make sure that every machine part or tool that is boxed separate travels in good condition. If a part is dropped in the crating process, the workman who dropped it is expected to call attention to that fact so that the part may be checked for finish and accuracy before shipping. While every effort is made to prevent such accidents, no workman is ever criticized for such an occurrence unless he is unusually careless, and then he is replaced. It is felt that a certain number of such accidents will occur anyhow, and it is better to accept this fact than to have the men afraid to speak up when a part has been dropped or damaged, and thus allow a part to be shipped which will be found unsatisfactory.

When a case has to be made for a new type of machine, data is kept on the amount of material used, sizes of pieces required, and time consumed, and the figures are sent to the Cost Department so that the cost of the crate can be determined. For all subsequent cases of the same type, Debit Requisitions bearing this information and referring to the crate by number are sent to the Cost Department.

A card file is maintained for all cases made, giving the dimensions and gross and net weights for both foreign and domestic shipments. Another file shows the amount of material used in each case, so that in

subsequent cases material for may assembled without delay.

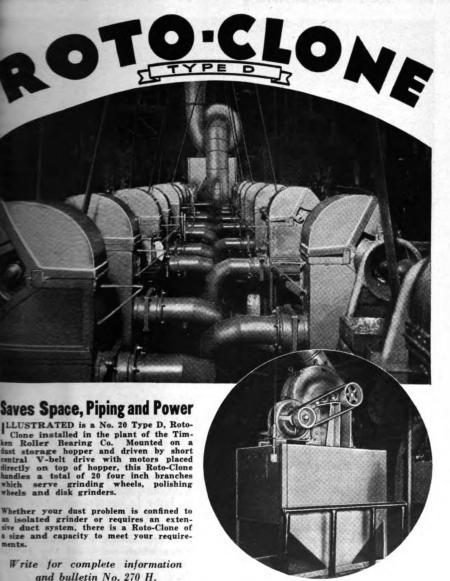
When a machine is to be crated, itemized packing list is made ou duplicate of everything that is to with the machine. This list is checked by the inspectors in the sembly department, and again in boxing department. The list sh what parts are attached to the chine, if any, and what parts be boxed separately. The small are, of course, anchored in the case as explained above. A co this packing list is placed in at velope together with instruct printed in three languages how to remove the slushing compo and how to lift and transport the chine most easily and without dat of injury. Printed instructions lating to the operation and ma nance of the machine are includ

The methods of packing and iping outlined here may seem it elaborate, but when the care that been taken in building the machitaken into consideration, it is not consistent to spend whatever is essary to make sure that the chines reach the customers in condition.

Boring 75MM Guns

extra operations did not take if time and they made the final risure. Measurements showed after the last reaming operation, holes were just as accurate as a lapping; the lapping was merely the purpose of getting the right fi

The tolerance for each hole 0.0008 in. and for the distance tween the two parallel holes 0.00 This should explain why such was necessary. We came well we the specified allowances. The diam of the hole did not vary more 0.00025 in. from the basic figure.



AMERICAN AIR FILTER CO., INC.

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Incorporated LOUISVILLE, KENTUCKY



This diorama is the central feature of the National Machine Tool Builders Association extat Cleveland's 1937 Great Lakes Exposition. It is one of a series of three designed to gricially show how machine tools increase employment and raise the standard of living. Juan Larrinaga, nationally famous mural artist, planned the exhibit and designed the dioramas. Exposition, which covers over 150 acres on Cleveland's lakefront, will be open through La Day, September 6th.

National Machine Tool Builders Exhibit at Great Lakes Exposition

How machine tools increase employment and raise the standard of living is graphically portrayed in a series of three large dioramas and six photographic transparencies in the National Machine Tool Builders Association exhibit at the 1937 Great Lakes Exposition, which opened in Cleveland May 29th. It continues through until Labor Day.

Located in "The Making of A Nation," the central educational feature at the Great Lakes fair, the exhibit demonstrates the importance of machine tools in building all the equipment that makes possible modern transportation and communication facilities, modern homes, and the thousands of articles that make living today more comfortable.

Juan B. Larrinaga, one of Ame ica's foremost mural artists and d every for almost maj American exposition since San Fra cisco's Panama-Pacific Fair in 191 has built the three dioramas. In the central diorama is shown one corne of a modern industrial plant, with large lathe in operation in the fore ground. In the other two, realist agricultural and transportatio scenes are shown with appropriat captions which point out the impor tance of machine tools in these two fields.

The photographic transparencies drive home the tremendous influence of the machine age in "Recreation," "Manufacture," "Construction,"

(Continued on page 94)

HAVE YOU CONSIDERED THE SIGNIFICANCE OF



Gairing floating tool holders provide positive correction for mis-alignment.

Accurate work depends more upon the holder and cutting tool assemblies being in perfect alignment with the fixture without deflection from the machine spindle than on any other factor.

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Modern Equipment at Work

Anodizing Adds to Life of Olds Pistons

THE comparative lightness of aluminum is a very desirable quality as applied to automotive pistons, consequently aluminum pistons are found in most automobile engines today. However, aluminum is also a comparatively soft metal, and until a method of hardening the wearing surface was discovered, this softness presented a problem.

The aluminum pistons used in the Olds car, for example, are subjected to an electrolytic treatment which gives the surface of the metal an oxide coating, of which extreme hardness is the dominant characteristic. This quality is akin to both the ruby and the sapphire, for both stones—forms of aluminum oxide—are physically the same, and are members of a family which includes emery and corundum.

The hardness of aluminum oxide makes it resistant to both abrasion and corrosion; thus pistons that have been subjected to this electrolytic treatment will give long and excellent service.

The electrolytic treatment of aluminum necessitates equipment very similar to that used for electro-plating, the article to be treated being immersed in a bath of special composition through which an electric current is passed. However, the processes are not the same. In electro-plating the piece to be coated is the cathode, while in the electrolytic treatment of aluminum, the work-piece is the anode—whence comes the terms anodic coating, anodic treatment, and anodizing. In ano-

dizing, oxygen, instead of metal, deposited on the surface of the worpiece, the oxygen combining with the aluminum to form aluminum oxide.

The anodizing equipment shown the illustration consists of a Meake Quick Transfer Return Type Platin Machine of the single-file design; the is, a single row of parts is handle through the various operations conprising the anodizing treatment. The machine is 29 ft. 6 in. long overal 8 ft. wide and 11 ft. 10 in. high, and is laid out to handle the operation in the following sequence:

- 1. Alkaline Clean or Etch.....30 see
- Rinse and spray to remove a trace of alkali.
- 3. Anodizing Treatment, whic may be varied from 10 to 2 min., at a current density some where between 12-15 amps. pe sq. ft.

The control of the temperature in the anodizing is critical and therefore facilities for cooling the solution and maintaining the temperature below this critical point must be provided.

- Rinse and spray for removing the acid solution used in the anodizing.
- 5. Hot Water Rinse.....
- 6. Unload. (Space must be provided for this operation.)
- Stripping operation, in which the oxide film is removed from the rack contacts.
- 8. Hot Water Rinse.....
- 9. Load Racks. (Space must be provided.)

The pistons are carried on racks,

sch of which olds ten pistons d which, in m. is supported **y** a carrier et is connected ith the autoatic conveyor. he pistons are eld on the rack y a rubber-covred pressure lamp to which re bolted alumimcontact points at can be reoved and renewwhenever they ecome too badly proded or worn. he balance of e rack is also ibber coated. his equipment ill handle 600 istons an hour rough the varius operations reuired for a comlete job of anoizing, depositing n oxide coating pproximately .0004 in. thick on ach piston.

The stripping peration referred as No. 7 is necssary due to the act that the conact points of the acks are made f aluminum, and

reatment. If the oxide film which orms on the metal during the anoizing process were allowed to remain the racks, the coating would in a hort time build up to a depth hat would interrupt the flow of current to the pistons. Conse-



Anodizing Aluminum Pistons for Use in Oldsmobile Engines

quently it is necessary to "strip" the aluminum oxide film from the contact points after each circuit, so that the amount of current supplied to the pistons will be ample and an oxide coating of the desired thickness will be assured.

The solution for the cleaning op-

eration, No. 1, is composed as follows: 4 lb. Tri-Sodium Phosphate; 4 lb. Soda Ash; 4 lb. Caustic Soda; balance water.

For the anodizing operation, the initial charge is composed of 28 gal. Sulphuric Acid at 66 deg.; 7½ oz. Antimony Trioxide, and water to make 91 gallons of solution.

Quick-Braking an A. C. Motor by Direct Current

N unusual and effective method of "dynamic braking"—that is, the use of the driving motor itself as a brake-is used by The Reliance Electric & Engineering Company, Cleveland, Ohio, in connection with the problem of quick and reliable stopping of chucks on machines in the plant of a large manufacturer of aluminum castings, in the same city. Since the finishing of each article requires only a few seconds, it is important to cut down the time necessary to stop the chuck between one piece of work and the insertion of the next. In the machines originally installed, braking was effected by a clutch and a mechanical brake-pedal. It was found, however, that this not only required considerable maintenance but also that it varied the stopping time obtained according to the degree of wear on the clutch and brake mechanism.

Under the new set-up the chuck is mounted directly on the shaft of a polyphase squirrel-cage induction motor controlled by a three-pole magnetic reversing controller. The contact positions of the controller are governed by two solenoids. The one which throws the motor on the A.C. line is operated by a starting button conveniently located on the machine itself. The other, which throws two terminals of the motor across a source of direct current, is connected to the

brake pedal. When the open presses the button the motor st up and he begins work. When piece is finished he quickly stops motor by pressing the pedal; w automatically disconnects the m from the A.C. line and connect to the source of direct current. controls are so interlocked electric

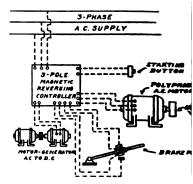


Diagram of connections for dynamic b set-up. (Courtesy The Reliance Elect Engineering Co., Cleveland, Ohio.

that the motor will not start the pedal is depressed.

This method of braking has favor because of its very low 1 tenance, its smoothness and the of controlling the stopping There is no jerking or vibration stopping because the braking a is magnetic and electrical in it ture, and does not depend on me ical friction. Furthermore, the ping time may be easily varied rheostat which, when once adi will cause exactly the same br effort to be exerted during the This is possible working day. cause there is nothing to alter in the braking mechanism. low-voltage direct current rec for dynamic braking is furnish a small motor-generator set whi this instance, is capable of deliv enough power for braking eigh



SMOOTHING AND FINISHING METAL surfaces for painting—removing paint, rust and scale—surfacing tile, stone, etc.—flat surface grinding smoothing welds and casting ridgesgouging and planing wood beams
—rubbing down new lacquer—buffing and polishing metal and other surfaces -are applications where Black & Decker Sanders and Sander accessories save hours of hand work. Four models, for all production and maintenance requirements.

owson, Md.

LACK & DECKER Portable Grinders and Sanders save you money by putting an nd to costly hand sanding, filing and buffing—and make quick work of heavy jobs thich are slow and awkward to handle on grinding, sanding and uffing machines. Ask your jobber for a demonstration, or write or catalog. The Black & Decker Mfg. Co., 720 Pennsylvania Ave.,



PORTABLE ELECTRIC TOOLS

chines. It is estimated that the new method has enabled the manufacturer to increase his production about 20 per cent from each machine.

N.M.T.B.A. Exhibit at Great Lakes Exposition

(Continued from page 86)

"Communication," "Schools," and "The Home."

In discussing the exhibit, Tell Berna, general manager of the National Machine Tool Builders Association, said, "Our exhibit should be of real interest to all. We have tried to point out that machine tools, 'the master tools of industry,' have made it possible for the United States to come closer to solving the problem of producing plenty than any other country in the world. They have made possible higher wages, shorter hours, and more and better goods per dollar of purchasing power than has ever before been known in history.

PUBLICATIONS

Vanadium Steels and Irons. A handbook of applied metallurgy, 189 pages, bound in flexible leatherette, illustrated with 71 photo-micrographs and 178 charts and tables. Published 1937, by the Vanadium Corporation of America, 420 Lexington Avenue, New York.

This new metallurgical handbook is a complete review and reference source for the chemical composition, physical properties, heat treatment, recommended applications and fabricating procedure of all irons and steels in which vanadium is an alloying element. Its up-to-theminute economic analysis of the place of alloy steels for structural applications, as well as for highly stressed parts, will be of particular interest to those engaged in fabrication and design.

Structural steels for light and heavy sections, the familiar S.A.E. alloy and related high-test steels, spring steels, cast steels, tool steels and nitriding steels are treated comprehensively, with complete data on physical properties and heat treatment. In each case, condi-

tions under which most favorable se ice results can be expected are speccally outlined, and suggestions are magnetic for correlating the choice of alloy st and its heat treatment with the fall cating procedure to be used.

The many charts and tables are be on latest authentic tests and analyse an important point in view of the recrapid progress in the art. Bibliograph references under each chapter head include a great deal of new work, special chapter of the volume is voted to consideration of high-test a cast irons, a field in which consider progress has recently been made.

The index of the handbook is partilarly complete. In addition to di references to particular alloy steels their properties, it permits a rapid erence by application headings to desirable alloy steels and recommen heat treatment. Price of the volum \$1.25, but it is available without chi to executives and engineers actually gaged in using or specifying alloy st and irons who request it on their b ness letterheads.

THE STANDARD HAND BOOK OF FRACTORIES—a 48-page manual of formation for engineers, plant supertendents and others interested in control of heat—has been published Standard Fuel Engineering Company. Post Ave., S., Detroit, Mich. It is fu information about refractory cem refractories, heat treating and other naces, as well as a copious assembly useful tabular material of interest those whose use of refractory materequires specific formulae.

Profusely illustrated from actual tographs of typical installations wide range of refractories, it shows ious methods of applying high term ture cements and also contains very useful tables of weights measures of the many types of fire-used in industry.

It is unusual in that it includes only data not often published in precise combinations selected by publisher but has been printed format which makes the book a hocket manual for the active engited.

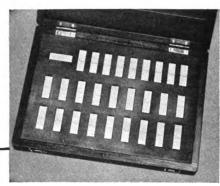
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Precision manufacturers who work with small dimensions find

this set very helpful. Many users of Johansson Gage Sets Nos. 1 and 2 have need for this supplementary set. Some purchase only the individual blocks to meet their special requirements.

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Ideas from Readers

This department is a clearing house for ideas . . . If there is a "kink" or short cu use In your shop, send in a description of it . . . Each one published will be paid

Sensitive Jack for Machine Work

By John A. Honeoger

SENSITIVITY is a desirable quality in a jack that is to be used to support work for machining operations, especially if the work is in

C O

Design of Hydraulic Jack for Machine Use.

the tool class. Unless contact with the work can be felt, the possibility of springing exists. And with the usual type of screw-jack, little or no sensitivity is available.

Sensitivity is the outstanding characteristic of the jack illustrated in the drawing, due to the fact that the hydraulic principle is employed in the actuating mechanism. The jack consists of the housing A, in which slides the actuating plunger B. The plunger is controlled by the screw C, which is threaded through the sleeve D. The sleeve is locked in place, when

properly located, by a lockscrew shown. At right angles to plung is the plunger E, which is also is snugly into the holder A.

The surface-ratio of plunger plunger E is such that any iment of plunger B will product proximately four times as

movement of plunger I versely, the pressure of end of the plunger E is portionately less than the plunger B.

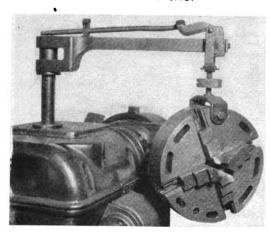
The fluid employed writer in the original was castor oil, which he cosity sufficient to propose leakage. The cosity of castor oil we change materially with reasonable change in perature.

Chuck Crane Lathe

BY R. B. LOVELAND

THE speed, accuracy, and efficiency of a lathe op often depends to some extent the condition of the chuck. quently a lathe chuck is entit much better treatment than it gets. Fortunately, the fashioned idea of dumping the on the floor under the mach under a bench and allowing it in the dirt and chips until again is fast becoming obsole improvement which can be more modern ideas cleanliness and safety.





Crane for Lathe-Chuck, In Use at Roanoke Shops of Norfolk & Western Railroad.

At the Roanoke Shops of the Norfolk and Western Railroad, chuck cranes similar to that shown in the illustration are in use. The crane not only keeps the chuck up off the floor and out of the dirt, but it also keeps the chuck ready for use at a minute's notice.

The short vertical shaft upon which the crane is swung is made integral with a flange which is firmly anchored with screws to the top plate of the lathe head. The horizontal arm of the crane is a forging, bored at one end to fit the bearing on the upper end of the vertical shaft. A flange holds the arm at the top of the shaft. To the opposite end of the horizontal arm is hinged a lever with a long handle, and to the lever a yoke is hinged in such position that, when the lever-handle is at rest on the top of the arm, the pull on the yoke will be downward.

From the yoke is suspended another yoke, drilled through each side so that a bolt can be passed through the yoke and through a hole in the chuck, as shown. Although the chuck can be held, by means of the leverhandle, at the right height for thread-

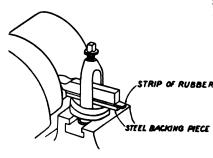
ing onto the spindle-ne further adjustment is a vided by having the command tion between the yokes are of two studs—one right a one left-hand thread—threed into a knurled nut. Revening the nut by hand sere the studs in or out, as quired, and raises or low the chuck accordingly.

A Spring Tool Wit out a "Gooseneck"

BY CHAS. H. WILLEY

RECENTLY one of to mechanics had occursion to turn a number large cast aluminum cas

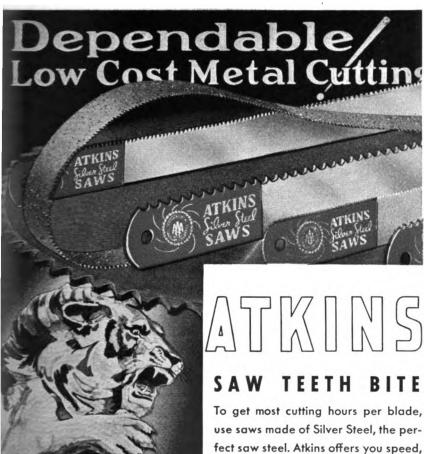
the design of which included a %-fillet. It was necessary that t fillet be perfectly smooth, as well the face and peripheral surface of t case, but it was found difficult to o tain the required smoothness. T workman experimented with the corventional form of gooseneck tool, an with semi-split tools into which set tions of wood were inserted to dampe the vibration, but without avail. Nor



A strip of rubber under the tool provides the correct amount of spring for a broad-nose tool

of the usual spring tools would work properly in this soft metal.

Finally the mechanic hit upon the idea of cutting a strip of soft rub-



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ng, sharp biting teeth ... make Atkins Silver el Saws cut easy, fast and clean.

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ber from an inner tube and placing it between the tool and the support, as shown in the illustration. With the

tool clamped tightly in the toolpost, the rubber provided just the right amount of spring for a broad-nose radius tool so that a smooth cut could be obtained.

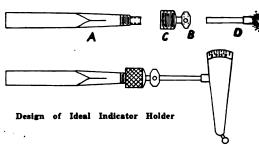
Ideal Indicator Holder

By C. F. FITZ

N Ideal indicator holder of simple but efficient design is shown in the illustration. The principal part of the holder is the shank A, which is made from a length of square tool steel of the same size as the toolbits used in the machines in which the indicator will be used. Thus the indicator-shank can be held in the ordi-

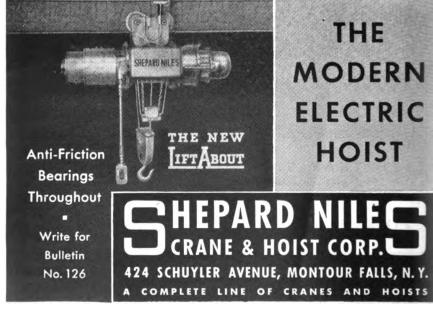
nary Armstrong toolholder.

One end of the shank is turn and threaded, and a ball race



formed in the end, the race consising simply of a concave seat to it a 5/16-in. ball. The part B, called the "dumb-bell," is of tool steel, the bat the outer end serving to hold the indicator arm while the inner bat provides the ball for a ball-and socket joint.

The dumb-bell is made in tw





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parts, one part consisting of outer ball and shank, and other prossisting of the inner ball, which drilled for a force fit on the end the shank. The ball is pressed on the shank after the shank has be inserted through the hole in the r.C. When the nut C is screwed or the holder A, the ball-and-socket joins complete.

The ball B is drilled both in the e and crosswise for the indicator as D, which is standard equipment wi

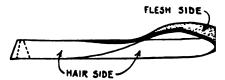
the indicator.

Cutting Belting Correctly Without a Square

By W. F. SCHAPHORST

OME time ago this writer wat taught a valuable kink for cuting flat belts, as illustrated in the sketch herewith. This kink, it appears is not known to most belt users, so am giving it here.

The old method, when cutting belt, is to use a square and make th



Drawing illustrating method of cutting ends e belt to insure that belt will be straight.

cut "absolutely square" with the sides of the belt. However, if done in the manner illustrated here it is not necessary to make the cut square. The most important thing is to simply make the cut "straight."

To do this, give the belt one turn as shown in the sketch and lay the ends one exactly over the other, both in perfect alignment. Then, by making the cut "straight" even though not square with the sides, it will be



Depth 16" 26" 36" 20" 28" 36"
16" 20" 26" 36" 20" 30" 28"
26" 36" 20" 30" 28"
26" 36" 20" 30" 28"
20" 30" 28"
20" 30" 28"
28"
28"
2011
90
36"
36"
48"
48"
60"
86"

Length

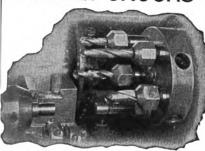
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FOR LITERATURE WRITE TO

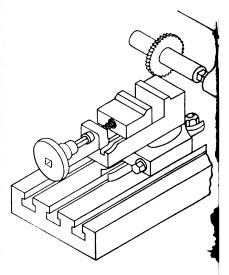
UNIVERSAL ENGINEERING CO. FRANKENMUTH, MICH. found that the ends will make a p fect fit. The cut may make an an of 45 deg. or even more with sides. The angle makes no differen

It is best practice, of course, to the belt square, or as nearly squas possible. By cutting it square belting material is more likely to saved than where the cut is made an angle. But to be doubly about it, even if a square is used is an excellent safety measure to the belt one turn as explained hand then if the square itself is true, or if an error has been made, error will automatically rectify its

Hand Wheel for Machin Vise

By WM. C. HILL

THE idea illustrated in the draging herewith was born when on of the toolmakers got tired of trying to open and shut the milling machin



Drawing Showing Use of Hand Wheel on Machine Vise

DOES High Speed production GIVE YOU A PROFIT?

In your shop right now perhaps there is a cutting job that you would like to do at a profit—It may be a tough alloy or a heat-treated steel or some other material on which ordinary high speed steels fail, especially at high speeds.

Circle C Super High Speed Tool Holder Bits are famous for their ability to machine materials considered unmachinable with regular high speed steel—But that is not the only value, on your every day production, you can use them to effect substantial savings by speeding up your machining operations. Circle C Bits have a tool life many times greater than that of ordinary high speed steel.

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IRTH-STERLING TEEL COMPANY

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LOS ANGELES

vise with the crank handle when the vise was used parallel to the table as shown. In this position the crank could be turned only half-way around, then it was necessary to remove it and change it to starting position again, repeating the action until the vise was opened or shut as required.

To eliminate this extra effort and also to save time the mechanic made a hand wheel, knurled for easy gripping and drilled at several places on the rim so that the final pressure can be applied to the vise-jaw by inserting a section of drill rod in one of the holes. The hand wheel is just the right size to clear the table, but is heavy enough to act as a flywheel; thus the mechanic can open or close the vise quickly by spinning the wheel.

The idea has proved such a good time-saver that it has been applied to all the machine vises in the shop.

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Address all communications to t Peruvian Consulate, 2314 Locust Stre Philadelphia, Pa.

Rockwood V-Belt Replacements Bo No. 795. This book, containing 32 pag 8½x11 in. in size, comprises a comple set of specifications for Rockwood Singl Groove V-Belts for use in every type application where V-belts are used. This is arranged numerically with size list prices and comparison table of oth manufacturers' part numbers. Copy from the by addressing Rockwood Manufacturing Company, Indianapolis, Indiana.

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25% to 35% LONGER broach life, with toughness to withstond heavy pulls and far greater resistance to abresion.

These are definite PROVED advantages of the NEW



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Over the Editor's Desk

"Life of an American Work-man"

T NDOUBTEDLY many of you who read this page have also been reading the continued article under the above title in the "Saturday Evening Post", but your editor would feel that he had been remiss in his duty if he did not call attention to this story. The article tells, in the first person and simple style, the story of the rise of an American workman and his experiences with the various tasks that he encountered in his climb from an apprenticeship in a railroad shop to the presidency of a great automobile factory. "workman" is Walter P. Chrysler.

Undoubtedly the article is being followed with especial interest by men who work-or have worked-in either railroad or automobile shops. They will recognize instantly the tasks and problems that confronted Chrysler and will appreciate the difficulties in which he found himself from time to time. The old-timers will also appreciate the part that Chrysler and his contemporaries played in the development of the industry; the installation of the first conveyor, the idea of passing the chassis along from one work-station to another on the assembly floor, the use of a paint "squirter" to do away with the paint brush, the beginnings of the demand for special machines, and so on.

The really important point of the whole story, however, is the fact that it is the saga of an ordinary man, even as you and I. Chrysler had no special advantages unless you could call average intelligence, an alert mind, and driving ambition special advantages. Perhaps to these should be added the faculty of getting along

with people and making t like him—but that, after a just another evidence of a age intelligence.

This American workman wo for what he got; he received no cial favors for which he had not qualified; there were no politically plugging for advancement for He simply took a good look at next job above him, worked enough to prove that he could found then went after it. The for is simple; anyone can follow it if he can follow it well enough can also be drawing a \$50,000-a salary when he is forty years.

There are no laws to prevent from leaving one job or taking other; there are no laws to pr him from holding a job because or race; there are no rules to mit against his success because of ha ligion; there are no laws or rules ordinating his ambition because his politics. That is America.

Progress

THE trend is toward she hosiery, so the Berkshire K ing Mills, largest manufacturer full-fashioned silk stockings in world, are scrapping 178 knitting chines, representing a capital in ment of \$650,000, in their Rea Pa., plant in order to make room more modern equipment.

Each machine is more than 33 long and comprises some 11 parts; thus the total of preparts being scrapped amount something more than 20,00 pieces.

According to Hugo Hemmerical perintendent of Mills, this indusone that has learned the unlesson of equipment handicanought to be a lesson in the where for other industries.



Designers, builders and users of tools and machinery all around the world appreciate the way McGILL Bearings hold up. Particularly under sustained heavy or intermittent shock loads they "just keep rolling along" — demonstrating the value of quality steels and precision construction which reduce wear and replacements to the minimum.

McGILL Bearings embody many exclusive types and designs. The MULTIROL Precision Bearings, for instance, are unequalled for great load capacity in small radial space. They far outrun plain bearings with which they can often be interchanged dimensionally. Since their introduction eight years ago, they have proved their superiority in thousands of installations—including practically every type of equipment from sewing machines to railroad locomotives. Many sizes and designs are carried in stock, and special designs are developed to meet your requirements.

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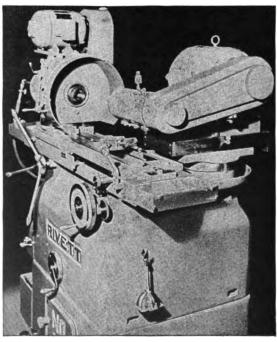
1500 N. Lafayette Street VALPARAISO, IND.

110

New Shop Equipment

Rivett No. 112 Precision Internal Grinder

The Rivett No. 112 Precision Internal Grinder, now being built by Rivett Lathe & Grinder, Inc., Brighton, Boston, Mass., is primarily built for medium and large tool-room work, straight,



Rivett No. 112 Precision Internal Grinder

bevel, two angle, or straight and bevel grinding at one setting. With low-speed spindle carrying a wheel up to 6 in. dia. by ½ in. face, it may also be used for external work. Its heavy construction and large slide areas assure long-life accuracy. The extreme simplicity of its design makes it specially effective on a wide variety of parts and practical for any mechanic to operate.

Single bevel or single taper work is

ground by swivelling the workhead the table topslide. A unique featur the swivel cross slide seen in acc panying cut. By swivelling this (slide to the desired angle and set the grinding spindle on the center of the machine, a straight hole be ground using power reciprocation

be ground using power reciprocation
the table, and then by
engagement of the lat
lever on the gear box,
power reciprocation ma
thrown off, and an ang
the mouth of the hole
be concentrically growithout rechucking, by
versing the cross
through its hand w
Similarly, by swivelling
table top slide, a taper
and a bevel may be gro

For small or medium the Rivett No. 112 is economical than an imatic gauging mac Many leading manufact throughout this country abroad also employ i preference to any grinder for experim and development work

The workhead and reciprocate with the while the grinding remains stationary. The arrangement gives to tionless support to grinding spindle and mits the speeds need for small hole work, workhead is mounted shoe and scraped to upper table and clamp any position by two Tin a T-slot. The ba

the workhead is graduated to swive deg. each side of center so that the can be set for taper grinding st than can be obtained by the 50 swivel of the table. An individual i drive provides three selectives g speeds. The spindle mouth is grout take Rivett 6 N.S., 1-in. collet cal collets and step chucks operated by draw in spindle or lever chuck. Jaw chucks, face plates, and other

res may be mounted on the threaded sindle nose.

The grinding spindle mounts in a racket carried on the cross slide and driven from a 2 h.p., 3500 r.p.m. more. The spindle is of rugged design for ng-life smooth running. Two spindles available, one for high speed and he for low speed. The cross slide on hich the grinding spindle bracket ounts is carried by a swivel which is advasted to be set in any position up 190 deg. right or left from center. elective hand or power cross feed is ansmitted to the cross slide when set any position.

The table is mechanically reciprocated of the motion is arranged to slightly tard as the table approaches its center stroke and accelerate immediately the central point is passed. This produces straight ground holes and overtures the danger of bell-mouthed bies. Eighteen selective speeds of table ciprocation are obtained through a car box mounted on the side of the

The Rivett tip-over diamond fixture used for truing the wheel. Once the roper hole is ground the diamond uing fixture may be set to true the heel for duplicating the original find.

All moving parts are fully enclosed all drive bearings, reciprocating bechanism and table ways are automatically lubricated by the Blanchard ulsolator System, which consists of a entral pumping unit and individually djusted pressure feeders for each earing.

"Metalmaster" Contour Sawing Machine

Announced as a new machine tool the letalmaster, manufactured by Contiental Machine Specialties, Inc., 1301. Washington Ave., Minneapolis, Minn., said to cover a wider field and function than have former "Doall" machines. According to the manufacturers, a novel esture of this machine is an entirely lew type butt welder which is instananous and full automatic; in its operation the saws ends are merely placed ogether in the welder, the operator wesses the switch and a positive weld seemed instantly and automatically. The set-up for internal sawing or the making of new joints out of coils of aw is thus done in a negligible time.

aw is thus done in a negligible time.

Many machining operations that are usually carried out by shaping, milling,

lathe work or torch cutting can economically be accomplished on the Metalmaster. In many cases, material is removed in one slab instead of being reduced to chips. Cutting is done continuously instead of with an oscillating motion. Similarly, the Metalmaster does slitting and removes slugs preparatory to milling. In contour work the contour saw closely follows the line through



"Metalmaster" Contour Sawing Machine

thick sections. The smooth thin cut of the saw leaves no waste.

The contour saw cuts true circles of any diameter, such a diameter not being confined by swing or throat. Material is saved because the rim is sliced off and not reduced to chips. Intricate, clean shapes are machined on the Metalmaster without disturbing the grain of the metal. It also cuts material such as high speed steels, tool steel, brass, copper, aluminum, various alloys and non-metallics.

The Metalmaster models are built in

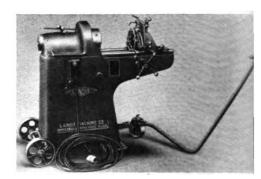


two sizes which have been found to be of ideal capacity for contour sawing. A 14-in. throat (distance from center line of cutting to column) will accommodate most tool and production work and a 30-in. throat machine is provided for users requiring this additional capacity.

2-In. "Little Landis" As a Portable Unit

The Landis Machine Company, Waynesboro, Pa., has developed a new mounting for the 2-In. "Little Landis" Pipe Threading and Cutting Machine, so as to permit moving the machine readily from one location to another.

As shown by the illustration, two wheels are used at the rear of the machine and a single guide wheel in a unit with the handle is used at the front end. The guide wheel and handle are detachable in order that no interference from them is experienced by the operator. Removal of the handle and wheel automatically lowers the machine to the floor, allowing it to rest solidly



2-In. "Little Landis" As a Portable Unit

on its own base.

To move the machine from place place, it is merely necessary for operator to raise the handle until swivel can be hooked into the sw bracket fastened to the front end of machine bed. Pulling down on handle then raises the machine appimately 2 in from the floor and it then readily be wheeled to any des location.

Equipped with an extension cord



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That's why mechanics like them

rom an expert mechanic comes an excelnt phrase describing the cutting ability of icholson, Black Diamond and McCaffrey iles.

"Your files", he says, "never 'refuse the ork', even on the hardest metals. Again again they save time and money on the ficult filing jobs."

Nicholson, Black Diamond and McCaffrey files accept the hardest jobs and do them rell. Their new tooth construction bites into the hardest metals; removes stock economically.

It is good business judgment to buy Nicholson, Black Diamond and McCaffrey Files because they do more work, cost less to use. Always uniformly high in quality, tested by experts. The greatest file value available to industry.

At mill supply dealers' and hardware wholesalers'. Nicholson File Company, Providence, R. I., U. S. A.

A FILE FOR EVERY PURPOSE

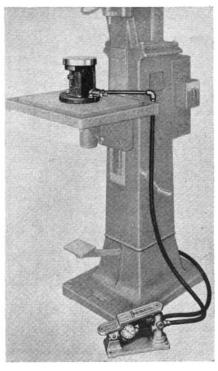
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114

plugging into a convenient socket, the "Little Landis" mounted on wheels is said to make an ideal portable unit for threading pipe from ¼ to 2 in. inclusive or bolts up to 11/2-in. diameter.

Air-Controlled Tapping

A further development in connection with the application of Haskins Air Control to tapping operations is an-



Haskins Air Jig

nounced by R. G. Haskins Company, 4667 W. Fulton St., Chicago, Ill. initial development made use of a device known as the Haskins Air Cylinder, to operate the foot pedal of their high speed tapper by means of compressed air. The tap head moved up and down, the piece to be tapped being held stationary on the work table.

To still further increase the sensitivity of air-controlled tapping, the Haskins Air Jig has been designed. In this case the tap head is held in a fixed position

and the blanks are presented to the t An air operated piston moves the jig table vertically, the movement bei governed by a foot pedal control va assembly. This latter unit consists a foot pedal and base, plunger val pressure regulator, and pressure gauge

As with the air cylinder, the new u does away with the operator having gauge the pressure which is applied the tap. It not only maintains unifor pressure throughout the stroke but controls the speed of feeding and versing the tap. The pneumatic cont can be accurately regulated to meet actly the requirements for each tapp job. For certain classes of work w the pieces are not too heavy or be this development affords new acces in high speed tapping and conside longer tap life.

Many maufacturing plants are fix the Air Jig invaluable for certain and delicate operations other than 3 ping—such as countersinking, count boring, reaming, spot facing, etc. WI the depth of such operations has to held to close limits, the constancy Air Control results in much more 1

formly accurate work.

Redesigned Type L Stearns Magnetic Separator

A new modern design for its pop Type "L" magnetic separator is nounced by the Stearns Magnetic Co., Milwaukee, Wisconsin. Several features are incorporated in this model, principal of which is the contained complete drive. The m can be operated from any conver A.C. source available. The unit is equipped with generator where D.C not available, the motor being ciently large to drive both generator separator.

Operating units are entirely conce so that all moving parts are thorou protected. This provides complete s for the operator. Anti-friction bear are used throughout. Transmissio new roller chain type with cut sprockets. The adjustable pin-type hopper has been lowered into the fr making it a decided advantage w hand labor is used for feeding mat By removing the division gate at by the lower panel the Type "L" a rator can be transported readily lift trucks. Special reinforced cross support the entire frame.

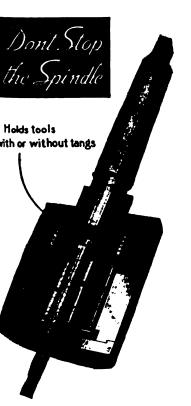
The Type "L" is being success

used in the treatment of abrasives,

Only three seconds required for tool change!

The Wahlstrom

Model "C" Chuck, for Taper Shank Drills



With a capacity range of from 1/16" to 11/4", the Model "C" Wahlstrom Chuck provides great flexibility and broad adaptability.

The Wahlstrom is the ONLY chuck that can take and hold the increased cutting pressure of the new high speed drills.

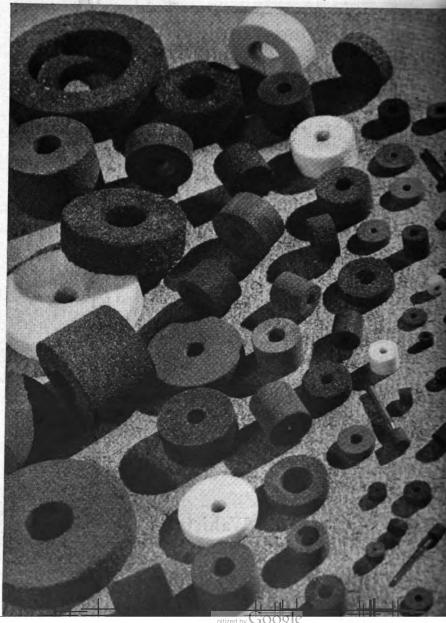
The Model "C" is the only chuck that will hold tools with 1-2-3 Morse Taper Shanks. The rolling action of the jaws increases the gripping power in direct ratio to the strain on the drill—it grips the shank, not the tang. It is self-centering and does not require the usual collets, sockets, adapters or other appliances.

This simple, sturdy and quick opening chuck will save many times its cost as it will drive tools with broken or twisted tangs, thereby lowering replacement cost and thus saving many times its original purchase price. Write for complete information.



Wahlstrom Tool Division American Machine & Foundry Co. 5502-5524 Second Ave., Brooklyn, N. Y.

No Collets. Sockets. Keys or Wrenches



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THE GRINDING WHEEL



is the HEART of the Modern High Production Internal Grinder

HE controls of today's high production automatic and semi-automatic internal grinders are built around the grinding wheel. Probably in more than any other type of grinder the performance of the machine depends on the performance of the wheel.

Several years ago Norton Company developed and introduced its D-Wheel* for this severe service a new type wheel that brought new standards to internal grinding—a wheel with increased ability to hold shape and size, to cut faster and reduce grinding pressure thus lessening the tendency of springing spindles and producing bell mouthed holes.

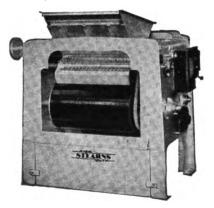
Today Norton Company has still further improved internal grinding standards. In many plants the new "B-E" Wheel is producing a marked decrease in grinding costs.

IN THE TOOL ROOM 38 Alundum Abrasive is particularly effective for the hundreds of miscellaneous internal grinding jobs on hard, tough tool steel alloys. Now designated as Structure 4.

NORTON COMPANY, WORCESTER, MASS.

NORTON ABRASIVES

ing powder, bone meal, cocoanut, carbon, sheliac, copper scale, dry bone, fertilizer, glass cullet, glass sand, gluten, casein, silica, grain, mait, stock, etc. In addi-



Redesigned Type L Stearns Magnetic Separator

tion it has profitable value in separating metal borings and turnings and reclaiming brass, bronze, and aluminum.

Bijur Type "L" Automatic Lubricator

To supplement their general line of lubricators having reservoir capacities from one to six pints, the Bijur Lubricating Corporation, Long Island City, N. Y., now releases to the field a new model to be known as Type "L", which

Heretofore, the "One-Shot" group of lubricators have been designed for pump discharge volumes of 1 c.c. to 30 c.c., or the equivalent of 30 to 900 drops of oil. On small machines and often on certain units of large machines, the total amount of oil discharge actually required, however, may be as little as 10 drops. The "One-Shot" model, Type "L", meets the lower range of oil deliveries in a simple and economical manner. As illustrated, the pump units are supplied with or without reservoir, the latter combination being adapted particularly to machine assemblies providing a cast-in reservoir.

Pressing the small lever on the near side of each lubricator with the finger raises the piston through a definite stroke, thereby drawing into the pump cylinder a definite volume of oil. On release of the lever, the metered quantity of oil is discharged—under the action of the piston return spring-into the tubing system. Thus a pressure of about 50 lbs. is developed in the system, and finally, metered distribution of oil to the various bearings is effected by the use of Bijur "Meter-Units". A single line of tubing leads from the pump, and junction fittings permit branching at any point to suit the layout of the machine. A Meter-Unit-provided for each bearing-may be located either at the

bearing or at adjacent junction point.
The Type "L" Lubricator unit measures approximately 2x3x3 in. Piston stroke, which is adjustable, may be set to give a total oil delivery of from 2 to 30 drops as desired for each type of machine. Hand in hand with this devel-







Bijur Type "L" Automatic Lubricator

has a reservoir capacity of one-quarter pint. As is true of the other Bijur automatic lubricators, the Type "L" lubricator is employed with a Bijur centralized, force-feed lubricating system.

opment are various methods of feeding oil to bearings where space is limited. They include compact fittings, tubing as small as 3/32 in. O. D., tapered drive connections, and small flexible leads.



Photo courtesy of R. V. Harty Company of Detroit, Michigan.

An electric eye, Baldwin-Duckworth Roller Chain and engineering skill all combine to perform a modern industrial miracle. The equipment shown here, too large to be photographed in an upright position, handles two giant 3000 pound doors with ease; rolls them open or closed automatically in ten seconds.

That Baldwin-Duckworth Roller Chain was specified in this instance is but further proof of its growing acceptance throughout industry. Made of selected alloy steels, properly heat treated and finished to exact size, it is smooth and flexible in operation — positive, dependable. Write for Catalog.

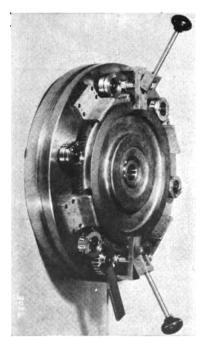
Baldwin-Duckworth Chain Corporation, Springfield, Mass.



In spite of its compactness, Type "L" equipment incorporates in its construction all of the Bijur advantages, such as, filtered oil, metered lubrication, instant and positive feed, single distribution line, and closed system. It has been devised to meet the requirements of upto-date lubrication on the latest types of machines, and is adapted to the individual needs of a large number of industries.

Garrison Gear Chuck

A precision, pitch line control Gear Chuck has been developed by the Garrison Machine Works, Inc., Dayton, Ohio,



Garrison Gear Chuck

for accurately chucking assemblies of various kinds by the pitch line of the teeth of the applied gear so that final finishing operations performed on the assembly will be true and concentric with the teeth of the applied gear.

Automobile engine flywheel assemblies, consisting of a cast iron flywheel with

an applied heat-treated steel starter ring gear, are a common example of the type of assembly which can be finished to advantage in the new chuck and by the new method. However, the chuck is also suited to use in the heavy machinery, tractor and other fields where hardened gears are pressed on cast or soft inserts, fianges and the like.

Standard practice in the past was to completely finish the heat-treated steel ring gear and then press it onto a cast iron flywheel, insert, flange or hub which had also been finished completely. But ring gears are necessarily subject to distortion in heat treating which might not occur in gears with a solid center section. The gears may also change while being pressed on the flywheel or insert. There are also errors in the machining of the flywheel or insert regardless of the care that is exercised. As a natural consequence, commercially perfect ring gears and flywheels or inserts have errors which are negligible in themselves but which, when assembled together, will cause an accumulation of errors in the assembly. Since the component parts of the assembly may be commercially perfect within the closest tolerances feasible, the only solution to the problem is through some operation that will "average-out" the errors existing in the assembly itself.

The "averaging-out" of errors in the assembly is accomplished by chucking the complete assembly by locating from the teeth of the gear and finishing some major control surface such as the crankshaft flange seat in the case of automobile engine flywheels. It is also possible to finish machine other portions of the assembly and in these cases the chuck is probably mounted on a drill press and a piloted tool used if only the bore or the crankshaft seat of the assembly is to be finished by reaming, fly cutting, and so on.

The gear is located in the chuck by chuck members spaced at intervals around the body. The chucking principle is such that the assembly is located in a manner approximating actual use if one considers any of the chuck members as the plnion or gear mating with the applied gear of the flywheel when it is in actual service. In short, the assembly is finished "in place," so to speak—which is the best assurance that it will run quietly, transmit power smoothly and uniformly, and be free of excessive wear.

Wegner Type CP Totally-Enclosed | SENSATIONAL Fan-Cooled Motor

To meet the demand for a totally-enclosed sealed unit for driving equipment which must be operated in atmospheres heavily laden with abrasive dusts.



Wagner Type CP Totally-Enclosed Fan-Cooled Motor

deteriorating metals and salts, explosive dusts, corrosive gases and extreme dampness, Wagner Electric Corporation, 6400 Plymouth Ave., St. Louis, Mo., has brought out the Type CP Totally-Enclosed Fan-Cooled Motor illustrated herewith.

The motor consists of a skeleton type stator, deeply grooved on the outside to increase radiation, which is provided with totally-enclosed ball bearing end plates with long machined fits to completely seal the working parts of the unit. An external blower mounted on the front end directs cooled air around the front end plate and over the cor-rugated surfaces and through a baffled back end plate down over the bearing. The motor shaft is of special alloy steel. Ball bearings are of the cartridge type and of the same diameter at both ends. The front end bearing carries the thrust while the back bearing is of the floating self-aligning type. The cartridges are normalized before machining, are The cartridges machined to very close tolerances, and are designed so that complete lubrication can be carried on during opera-tion. No cored holes are used for introducing lubricant, eliminating con-tamination of grease by foundry sand. The cartridge caps are also specially designed to prevent entrance of water along the shaft.

The back end plate is of the one-



FLEXIBLE REAMER CORP.

3656 Lincoln Ave., Chicago, III.

piece deflector type to aid in keeping the bearing cool. Both end plates are provided with threaded air gap holes to make carrigap; checking an easy task. The feet are of unbreakable steel and are electrically welded to the frame.

"Disc-Brake" Motors Have Built-in Brakes

A new power unit to be known as the "disc-brake" motor has been made available by The Reliance Electric & Engineering Co., 1088 Ivanhoe Rd., Cleveland, Ohio. The motor combines,

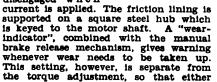


Reliance "Disc-Brake" Motor, (A.C. Squirrel-Cage Type.)

in a single unit, the functions of a motor with those of a powerful brake, and is useful for small cranes, hoists, auxiliary movements on machine tools and other equipment in which quick, automatic and accurate stopping or the holding of a load is necessary. It is stated that with these disc-brake motors it is often possible to connect the drive direct and thus to avoid the need for clutches. Reliance motors of any operating characteristics both D.C. and A.C., may be specified to meet any particular case.

The brake itself consists of a simple

and compact disctype friction device, mechanically and automatically engaged when the current is shut off and magnetically disengaged when



may be adjusted independently. Varying braking power, from maximum to 50 per cent of maximum, may thus be obtained as needed.

The brake mechanism operates equally well in any position, and may be fitted to any standard Reliance motor except those of the fan-cooled type. All mounting dimensions conform to N.E. M.A. specifications so that standard brackets and bases may be used. The brake cover, which is entirely separate from the mechanism itself, may be readily removed by loosening four cover screws, thus making all parts easily accessible.

Cleco B1 Scaling Tool

The Cleveland Pneumatic Tool Company, \$734 East 78th St., Cleveland, Ohio, is introducing the Cleco B1 Scaling Tool for general scaling, beading and peining. This tool is particularly well adapted to the removal of weld splatter and excess metal in production welding, and has been found ideal for removing sand from castings, particularly those with small intricate cores.

The special feature of the Cleco B1 Scaling Tool is the graduated control valve. Located by design at the rear end of the tool, the natural motion of the operator's hand automatically admits the right amount of compressed air to most effectively do the work. Very slight pressure admits sufficient air if the work is light. If the cut is heavier, there is naturally more hand pressure, and con-sequently more power to do the work. Thus, automatically, air consumption is reduced to a minimum, and the tool operates always at the maximum of emciency and economy. The travel of the control valve can readily be set to suit the maximum power requirements of the work. The exhaust from the tool is so directed as to blow off the chips and



Cleco B1 Scaling Tool

scale, and thus increase visibility.

Novel in design and most convenient and effective in application is the chisel retainer of the Bi Scaling Tool. Holding the chisel always securely when the tool is in operation, the retainer releases by the mere flick of the operator's thumb. The "nose" or chuck of the



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WHEN YOU CHOOSE FROM THE COMPLETE MORSE LINE

HE INCLUDES WIGH SPEED AND CARBON DRILLS • REAMERS • CUTTERS • TAPS and DIES • SCREW PLATES • ARBORI CHUCKS - COUNTERBORES - MANAGELS - TAPER PMS - SOCKETS - SLEEVES



No matter what your needs, your Morse distributor can meet them from the wide Morse line. And because every Morse Tool must pass high standards, it pays to rely for every tool on this name that is a byword in the shops of the world.

When you write "Morse" on the order form, you specify tools that are inspected at every step of their manufacture; tools whose excellence is the result of years of tool-making experience.

No matter what your job, there is a Morse Tool of the proper size and type to do it.



A Conveniently Located Morse Distributor Will Give You Prompt Service



MORSE THERE IS A

DIFFERENCE

TWIST DRILL & MACHINE COMPANY

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tool is square, affording the maximum of security against turning of the chisel in the chuck, as well as greatest possible

Chisel blanks are readily made from 1/2-in. square tool steel in accordance with a drawing which is supplied by the manufacturer. The Cleveland Pneumatic Tool Company maintains a stock of blanks for immediate shipment, and the prices of both the scaling tool and the blanks are very moderate.

The Cleco B1 Scaling Tool weighs about 3 lb. 6 oz., and is approximately 11 in. long. It has a bore of 1 in. and a stroke of 1% inches.

Presto Tool Holder

To aid in speeding up lathe work, The Presto Mfg. Co., 120 N. Newport Ave., Detroit, Mich., has developed the Presto Tool Holder shown in the illustration. The shank of the tool holder is of the same general design as the usual type of interchangeable tool usual type of interchangealie tool holder, but the holder is equipped with a head in which four %-in. tool bits can be held. The tool bits can be individually set for the correct height. The indexing is said to be accurate, operating as follows: the nut which holds the head to the shank is loosened.

then the turret is turned clockwise until the required tool snaps into the lock and thus into position. The nut is

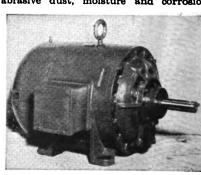


Presto Tool Holder

tightened again, and the tool is ready for work. The tool is thus easy to set up, compact in size and is said to be rigid and accurate.

Westinghouse Type CS Dual Ventilated Fan-Cooled Squirrel Cage Motors

A dual ventilated fan-cooled squirre cage motor which is protected against abrasive dust, moisture and corrosion



Westinghouse Type CS Dual Ventilated Fan-Cooled Squirrel Cage Motor

has been announced by the Westinghouse Electric & Manufacturing Co. East Pittsburgh, Pa. The motor, to be known as the Type CS, has been de-signed especially for use in automobile factories, foundries, cement plants, coal tipples, machine shops, steel mills, chemical plants, dye houses, tanneries, packing plants, and so on, where severe service is required. The motor may also be installed outdoors without additional protection.

The motor frame contains two separate sets of air ducts, one set internal and one external. The internal ducts are open in the interior part of the motor and the external ducts are open on the outside of the motor frame. The two sets of ducts are separated by a common wall.

The heat exchanger principle is employed for cooling. An internal fan on the rotor circulates warm internal air through the internal ducts, the walls of which are cooled by the external fan blowing larger volumes of cool air through the external ducts, providing rapid transfer of heat from the motor and thus insuring long insulation life.

The housing is designed so that fresh grease enters the outside edge at the top of the bearing and excess or used





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The owners of BILLINGS "Duo-Forged" Shop Tools gladly lend but insist their tools be returned. They know their Wrench and Tool investment means a "Life-Time" of service because it's backed by the BILLINGS Guarantee. Ask any mechanic—he knows.

"Shop Tool" Booklet

illustrates these popular Tools mechanics have used for years—you'll want a copy, WRITE Dept. O.

COMMERCIAL DROP FORGINGS . BOARD DROP HAMMERS and DIE MAKING MACHINERY

BILLINGS

THE BILLINGS & SPENCER CO.

HARTFORD, CONNECTICUT, U. S. A.

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grease is discharged at the bottom inner edge to the overflow sump. Since adding fresh grease automatically cleans the used grease from the bearing, it is unnecessary to incur the expense of periodically dismantling the motor to clean the bearings. The used or excess grease may be readily removed from the overflow sump through a pipe plug opening. The cartridge-type bearings are fully protected when the rotor is removed.

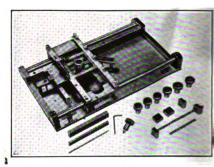
Micro-Precision Universal Jig

The new Micro-Precision Universal Jig, manufactured by Henderson & Kaye, 108 N. Batavia St., Batavia, Ill., is said to be rapidly becoming an indispensable part of the tool equipment. Its many distinct advantages and the varied uses make this instrument outstanding in its field.

The Micro-Precision Universal Jig insures the maximum of speed and layout accuracy. It permits fast setting up, laying out and drilling to accurate centers. Laying out accurate centers for 3, 4, 5, 6, 7, 8, 10, 12 or 16 equally spaced in the circumference is very simple. For example, it is said that with the Micro-Precision Universal Jig, a layout for six

holes can be set up, the holes drille and reamed all in a period of only forty five minutes and all to an accuracy of 0.001 inch.

Principal uses of the Micro-Precision



Micro-Precision Universal Jig

Universal Jig are for punches and hold ers; accurate layout and drilling; diblocks and dies; production jigs; dril jigs; master plates, stripper plates model work, and special tools.

A folder describing and illustrating this remarkable instrument will be sen by the manufacturer on request.

METAL SAW BLADES



Solid or Inserted Tooth Circular Saws. In all standard sizes to fit any cold saw machine.

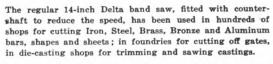
Made of extra tough steel to give greatest value metal cutting. Write for prices and further details.

SIMONDS

SAW and STEEL Co.

FITCHBURG, MASS. CHICAGO, ILL.

NEW-14 inch"DELTA" Netal-Cutting Band Saw



Here is a new and improved back-geared model which is even more ideal for this work. It is the perfect machine for the general machine shop, toolroom or experimental shop, where many different materials must be cut.

It takes the place of a power hacksaw in cutting off bars and shapes; it is used in the toolroom for sawing off tool, die and fixture stock; it will cut uniform strips from sheets; it saves hours of time in cutting templates and similar tools, and will cut almost any material, such as asbestos, mica, vulcanite, fiber, etc. . . . difficult to cut by ordinary means. Provision is made for four low metal-cutting speeds and one high speed for wood sawing.

Write for special circular giving full details and specifications.

79⁵⁰

14" Back-geared Metal-Cutting Band Saw, complete with guards, 8" arbor pulley for wood and cone pulley for metal. With one 14-tooth metal-cutting blade. Without light attachment, belts, stand, motor or motor pulley. Shipping weight 175 lbs.

The draw-die segment ring illustrated was impractical to cut on the milling machine because its diameter was too large for any available miller. It was cut with ease and speed on the Delta band saw. Try your next "awkward" job on one of these versatile tools.



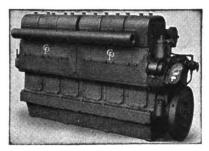
TA MANUFACTURING CO.

TIENNA AVE

MILWAUKEE, WISCONSIN

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The Chicago Pneumatic Tool Company, 6 East 44th St., New York, N. Y., presents a modern Diesel engine, in which are incorporated the latest developments of construction, improved design and



CP Type 8 Diesel Engine

combustion control. The engine is of the four-cycle injection type, especially designed for medium speed and continuous duty.

The engine is made in four models, with three, four, six or eight cylinders. The three-cylinder Model 38 CP delivers 90 h.p. at 600 r.p.m. or 112½ h.p. at 720 r.p.m. The four-cylinder Model 48 CP delivers 125 h.p. at 600 r.p.m. or 150 h.p. at 720 r.p.m. The six-cylinder Model 68 CP delivers 187 h.p. at 600 r.p.m. or 225 h.p. at 720 r.p.m., and the eight-cylinder Model 88 CP delivers 250 h.p. at 600 r.p.m. or 300 h.p. at 720 r.p.m. In all cases the bore is 8 in and the stroke is 10½ inches.

The shape of the combustion chamber, the least on the stroke is 10 to 10 t

The shape of the combustion chamber, the location of the streamlined inlet valve, and the fuel injection system are correlated to give great combustion efficiency. The method employed to mix the fuel and/air results in a clean exhaust at all loads and a fuel economy said to equal that of the large, low-speed Diesel engines. Standard accessories are externally mounted and removable as complete units for ready repair or replacement. Dust and oil-tight covers on cylinder heads and over the camshaft permit easy access for adjust-

Every part of the engine is designed for ample strength, and the material has been effectively disposed to obtain maximum rigidity with minimum weight. The base is heavily ribbed under the bearings and a deep channel section at each side imparts longitudinal stiffness. Crankshaft journals and crank pins are

made unusually large to avoid torsion Die-pressed crankshafts gi vibration. ing ideal grain flow along the shallong-wearing valve seat inserts, Sat bearings, stressed studs and bolts nickel chrome steel, and high tensi alloy iron castings contribute to the superior construction. All wearing par of the engine are protected by enclosing covers which are actually dust-tight, yeasily removed for inspection. The gine is 100 per cent positively and aut matically lubricated. No part of the engine requires hand oiling or greasing The engine-driven fuel transfer pun draws fuel from the storage tank as forces it through a filter to the ind vidual Bosch fuel pumps. Instant star ing is provided by a simple starting valve which admits air to a camshaf driven rotary distributor.

Fostoria Canopy Localite

The line of localized or supplementa lighting units manufactured by T Fostoria Pressed Steel Corporation, Fo toria, Ohio, has been augmented by ti addition of the Canopy Localite, illutrated herewith. This unit was develop to provide a relatively large spread diffused illumination with a minimu of brightness and glare from the ligh source.

The Fostoria Canopy unit is made with three sizes of luminaries—20,



Fostoria Canopy Localite

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Vascoloy-Ramet is available in three forms: (a) completely finished tools, (b) milled and braned tools, and (c) blanks. V-R blanks are formithed in 5 standard styles and in sines to meet every requirement. To make tools with V-R blanks is a sample operation, fully described in a new instruction booklet, tent free—upon request.

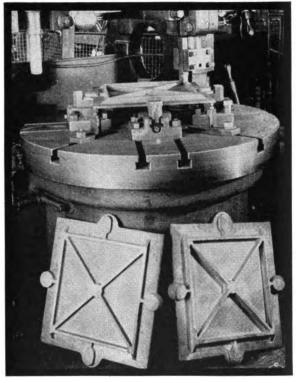
Cast iron and cast iron alloys, semi-steel, brass, bronze, aluminum and aluminum alloys, non-ferrous metals and materials, all steels from the softest to the hardest and loughest alloys — whatever the material there's a V-R grade which precisely fits the job.

Produced in 17 standard grades, of different tanta.umtarbide content, strength and hardness, it alone covers the entire range of machinable materials with "a grade for every use."

That is why Vascoley-Ramet is setting new records daily for increased pieces per grind, for faster time from foor to floor, for lowered production costs.

This is the reason for its rapidly increasing acceptance as the preferred tool material, in great industrial plants and in small shops, as well, throughout the country.

The new V-R catalog pricelist will be sent upon request.



Intermittent cutting, core plate 18" x 20", ribbed on one side, flat on the other. Material: Cast iron. Tool used V-R, grade A, 1½" square; style 6, ground 6° clearance, flat top; 1/16" radius on nose. Two core plates are shown in the lower foreground, at the right—un-machined; at the left—finish machined.

Tool	Used	Feed	Depth	R.P.M.	Speed	Pieces Per Grind
	oloy- met	.025"	1€" to ½"	60	180 FPM Maximum	25 (Both sides)
Grac	le A		ŀ	l	Ĭ	

VANADIUM-ALLOYS STEEL CO. VASCOLOY-RAMET DIVISION, NORTH CHICAGO, ILL.

VASCOLOY - RAMET

.. The TANTALUM CARBIDE TOOL MATERIAL ...



A GRADE FOR EVERY USE

Sales Offices: Pittsburgh.....Pa. New York N. Y. Springfield....Mass. Boston.....Mass. Providence R. I. Cincinnati.....Ohio Cleveland......Ohio Detroit Mich. Chicago.....Ill. St. Louis Mo. Buffalo......N. Y. Philadelphia.... Pa. Newark.....N. Knoxville Tenn. Los Angeles....Cal. San Francisco, Cal.

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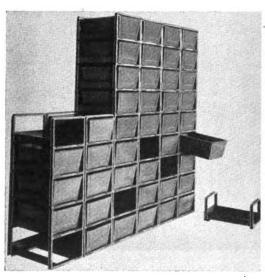
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and 60 in. long—and the smallest size is available on the regular Fostoria Localite supporting arm. The unit is recommended especially for installations where reflection from bright surfaces is a problem, such as in metal scribing, drafting, inspection work, and so on.

Stackracks

Designed originally for orderly arrangement and easier handling of stockroom boxes, the sectional steel racks known as "Stackracks" are also proving



Stackracks for Storage of Parts in Process

ideal for parts storage in process of machining or assembly, according to their manufacturer, Stackbin Corporation, 53 Troy St., Providence, Rhode Island.

This application of Stackracks, which was suggested by users themselves, takes full advantage of the easy set-up, rigidity, and easy disassembly of the racks. A Stackrack may be set up quickly, without tools, anywhere in the plant, and just as easily taken down and moved elsewhere.

Built in single units, each of which holds a tote pan, Stackracks save space, save time spent piling or unpiling pans, and permit the use of lighter, cheaper pans. Units are built to fit tote pans of any size, and any number of units may be used to provide a Stackrack of any size or shape.

General Electric Vapor Lamp Announces Modernized Series of Long-Tube Mercury Lamps

A modernized series of mercury lighting units of the long tube, Coope Hewitt type—improved in lighting ciency, operating stability and appealance—is now being introduced by General Electric Vapor Lamp Compathoboken, N. J. The new "50-in. It source" operates at 350 watts A.C. supply the same light output which

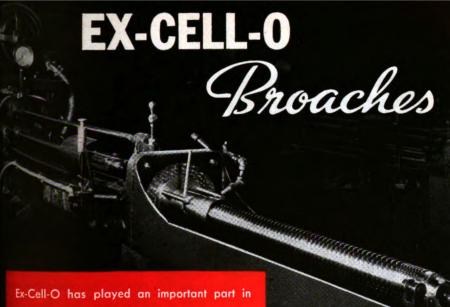
quired 450 watts in previ models, its bare-lamp efficie being 19.4 lumens per The new "33-in. light sou operates at 280 watts in trast to a previous 350, with efficiency of 17.1 lumens

As equipped with newly signed enameled reflectors, complete lighting units h an overall efficiency of at 15 lumens per watt, exceed almost every other lampreflector combination. the reflector and tube are intended for mounting in true horizontal position. St ing, and restarting after current operation, is ins The entire unit taneous. been redesigned to maintenance and make cl ing easy. All tube connect are made with insulated s terminals.

In contrast to more contrated "bulb type" light southis type of mercury tuns said to have the inherent vantages of large light-se

area and low unit brightness, with the use of light-absorbing diffiglass. Thus it is particularly suffer precise seeing tasks requiring a imum of shadow and glare and a smum of detail-revealing clarity. I applications include metal was chine assembly, textile manufacture of fine machine parts chine assembly, textile manufacture.

Light from the new units has same cool, spectral characteristic from former Cooper Hewitt lamps-in visual effectiveness where color ognition is not a factor. In ada "skylight" unit combining the long-tube light source with inca cent lamps is now offered for use a close approach to daylight color is required.



developing broaching to its present status as

a production operation combining extreme accuracy with speed, versatility, and low cost.

Ex-Cell-O Broaches are available in both push

and pull types for internal, external, and surface applications; they are furnished in solid,

replaceable section, or combination form.

Complete information covering the widened scope of broaching and advanced design of

Ex-Cell-O Broaches will be gladly furnished upon request.



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Drill Jig Bushings **Grinding Spindles**

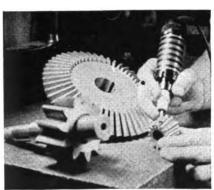
Counterbores & Broaches **Carbide Tool Grinders**

Precision Boring Machines Precision Thread Grinders Hydraulic Power Units XLO Carbolov Tipped Tools EX-CELL-O CORPORATION, DETROIT, MICHIGAN Please send literature on Ex-Cell-O Products as indicated.

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HANDEE TOOL OF 1001 USES

GRINDS, DRILLS, SAWS, POLISHES, ROUTS, ENGRAVES, CARVES



HERE'S the wonder tool that is effecting such revolutionary savings in many laboratories, model and tool rooms and on production lines. Hard-to-get-at places on machines can now be repaired without removing the part or dismantling machine. The Handee uses 200 different accessories, instantly interchangeable, for work on all metals, alloys, bakelite, celluloid, wood, glass, resins and other hard substances.

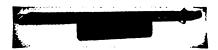
Finest, speediest, most powerful tool for its type. 25,000 r.p.m. AC or DC, 110 volts. Weighs only 12 ounces. No shop or factory can afford to be without the Handee. Try one.

Order Today on 10 Days Trial or Send for Catalog. De Luxe \$18.50
Model
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6 Accessories Free

CHICAGO WHEEL & MFG. CO.

□ Send	Cat	alam	M. M. S. 8			
			Handee	on	10-Day	Trial
Name .						
Address				*****		

The higher light efficiency of the new lamps results from a new regulating circuit, equipped with a special Pyranol capacitor. Power factor is 90 per cent for the 50-in. light source and 85 per cent for the 33-in. unit. A unique



G.E. Vaper Lamp Co. Long-Tube Mercury Lighting Unit

characteristic of this new circuit is the fact that the starting current shows almost no initial surge above the operating level—an important factor from the standpoint of wiring and switch capacity.

Instant starting and added dependability have been obtained by substituting a new vacuum type interrupting switch in place of the "shifter" formerly used for starting the mercury arc within

the tube.

All Welded Dipping Baskets and Trays for Plating

The Udylite Company, 1651 E. Grand Blvd., Detroit, Mich., has announced a complete line of dipping baskets and trays for plating use. Unusual strength long life, and ability to carry heavy loads without bulging are qualities at tributed to all welded construction. It is stated that all welded construction eliminates the possible weakness a points of great stress by the use of



Udylite Platers' Tray with Solid Sides and Mesh Bettom

cross member reinforcements. Wire on mesh, bottom and side cross members are welded to the basket or tray frame thus forming the parts into one integra unit.

Udylite dipping baskets in the bai

FOR TAPER TAPPING



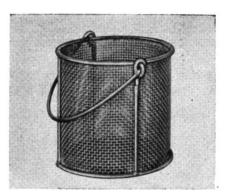
HERE the depth is great, the taper steep, or the material too tough for jam cut chasers, the Geometric Class R Receding Chaser Tap is the solution to your taper tapping problems. The taper bar within the tool allows the chasers to recede evenly, cutting the correct taper with a minimum of power consumption, giving a smooth, pressure-tight thread. An adjustable trip accurately determines the length of thread.

A sturdy, compact, simply-designed, precision-built tool—a dependable tool. That's Geometric's Class R Tap.

May we send you a catalog?

THE GEOMETRIC TOOL CO.

NEW HAVEN, CONN.



Udylite Swivel Bail Type Basket with Reinforced Sides and Bottom

handles. The trays are furnished with either solid or mesh sides. Both baskets and trays can be furnished made of steel, brass, copper, aluminum, monel metal, and nickel chrome in standard shapes, and various gauges of wire and mesh. Special all welded containers other than standard can be made according to specifications.

Udylite also offers a Duro-Welded reinforced rigid ball type steel basket which is covered with hard or soft rubber having a high resistance to all acids with the exception of concentrated nitric and sulphuric. The Duro-Welded type is furnished in two sizes, the 10x 10 in. and the 12x12 in., in ½-in. mesh or larger.

Sunco Soundmaster

A sound reinforcing amplifier system with 2,400 times more audio power than the human voice, in a case only 13½x13½x9 in. deep, is a feature of the new Sunco Soundmaster, product of Sun Engineering Co., 4238 Lincoln Ave., Chicago, Ill.

The Soundmaster is a completely self-contained microphone-amplifier-loud speaker system designed to meet the need for a light, five minute set-up unit for use by public speakers, preachers, soloists, orchestras, showmen, and son. It is powerful enough for audiences up to 3,000 and outdoor areas up to 25,000 sq. ft. Two extra inputs are provided for microphone, music pickup or phonograph. The audio power output is 12 watts, about four times the



MORE FOR YOUR MONEY

in *The Cincinnati*

12" & 14" Pedestal Grinders

You get "more for your money" in these NEW 12" and 14" Pedestal Grinders. These fine new tools have the same high quality as always yet look at these remarkable prices.

Grinder complete with 2 H.P. motor and two 12"x2" wheels, \$200.00.

Grinder complete with 3 H.P. motor and two 14"x21/2" wheels, \$250.00.

Send for new Catalog, just off the press.

THE CINCINNATI ELECTRICAL TOOL CO.

CINCINNATI • OHIO • U. S. A.

Division of R. K. LeBiond Machine Tool Co.

Builders of Electric Drills, Screw Drivers, Nut Setters,
Tappers, Valve Grinders, Aerial Grinders, Tool Post
Grinders, Buffing & Polishing Lathes, Bonch and Podestal
Grinders.



HARD-TO-PLEASE BUYERS of Flat Wire

DO you use cold-rolled steel flat wire...high or low parbon? Are your specifications macting?

We specialize in making this product to meet exacting requirements... and are completely satisfing customers who are very particular about the flat wire they buy. Our steel is made in our own

mill...in special, small openhearth furnaces which permit exceptionally close control of the melt. Our organization is trained to handle difficult specifications requiring close attention and careful "follow-through".

We would be glad to receive your inquiry for further information, prices, or samples. Types:—Roebling Cold Rolled Flat Wire is made from both high carbon and low carbon steels, produced in Roebling's own mills. The high carbon flat wire is available in tempered and untempered types.

Finishes: — bright, black annealed, bright annealed, tinned, galvanized, blued, strawcolored, coppered.

JOHN A. ROEBLING'S SONS COMPANY
TRENTON, N. J. Branches in Principal Cities

 ${\it Roebling}$ cold rolled steel flot wire



138

power of the average console radio and 2.400 times the power of the human voice at loud speech.

The Soundmaster is equipped with a 12-in. 15-watt speaker which gives large air displacement and thus great carry-



Sunce Soundmaster

ing power without the effect of loudness. This is a desirable feature in paging or announcing in the better class hotels, clubs, department stores or hospitals. It operates directly from 110 volt 50 to 60 cycle lines, and converters for battery operation can be fur-

In permanent installations the ampli-

fler and microphone are usually located at a central point connected to speak-Industriers installed where desired. used for ally such installations are inter-department calling and paging between sales counter and stockroom in churches, bus and railway stations undertakers chapels, theaters, amuse-ment parks, carnivals, and so on. No skill is required for installation.

Lauber File Handle

The Lauber Die Cast File Handle product of The Lauber Company, 3240 W. National Ave., Milwaukee, Wis., is constructed of high grade hard wood with a metal composition ferrule did cast on the wood and automatically machined. The ferrule can neither turn



Lauber File Handle

nor loosen, holds the file firmly, protects the head of the handle from chipping

on Special Pumps . . . by telling YOUR requirements to US.

OFTEN, from our extensive line, we can adapt STOCK PARTS for the user's benefit.

What are your pump needs?

Brown & Sharpo Mfg. Co. Providence, R. I.

BROWN & SHARPE PUMPS

Don't let low speeds handcuff your flexible shaft equipment



A three to one speed increase for any flexible shaft machine!

Small grinding wheels or mounted stones work best at much higher speeds than most flexible shaft machines can produce. The wheels wear down evenly and last longer. And there are many other places where higher speeds are de-sirable for better efficiency. This High Speed Attachment fits the Kellerflex machine, and can be adapted to any other make. It uses spiral bevel gears of special heat treated steel, with all moving parts ball bearing mounted. The housing is of special tough aluminum alloy which is light and easy to handle. It takes less than a minute to assemble the attachment on the shaft ready for use. For complete information write to the Kellerflex Sales Dept., Pratt & Whitney, Division Niles-Bement-Pond Co., Hartford, Conn.

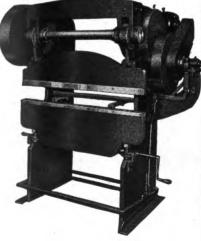


KELLERFLEX

HIGH SPEED ATTACHMENT

CHICAGO STEEL PRESS

No. 253



Does 40% to 60% of the forming work turned out by the average shop.

Here's a profitable, economical brake ideally adapted for rapidly forming metal sections such as in stoves, refrigerators, soda fountains, steel cabinets, metal furniture, steel boxes, and a great variety of sheet metal specialties. Its variable speed drive operates from 17 to 50 strokes per minute. The No. 253 CHICAGO STEEL PRESS is accurate, compact, and ruggedly constructed of highest quality materials.

Sizes 4, 5 and 6 ft. capacities, up to 10 gauge.

Write for Circular No. 253

DREIS & KRUMP MFG.

7418 LOOMIS BLVD.

CHICAGO

ILLINOIS

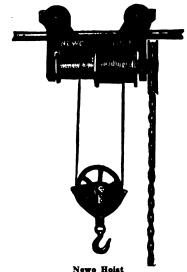
if rammed against a vise or other solid obstruction, and will withstand an unusual amount of wear and abuse.

The handle is made in six sizes for files from 4 in. to 20 in. in length.

Newo Hoist

The Newo Hoist Co., 17309 Fernway Rd., Cleveland, Ohio, announces the development of a hoist of simple design for use in handling loads which are less than 2000 lbs. and have to be moved only a short distance. Although the hoist is gearless, it has a lifting ratio of approximately 15 to 1, this ratio being obtained by winding the cable on a large drum as a smaller drum unwinds. power is applied by means of a sprocket and endless chain.

A latch acts as a ratchet when raising the load, permitting it to be suspended at any height desired. This latch is disengaged when lowering the load, but in-



News House

stantly stops the downward movement upon being released.

The hoist wheels are grooved for 1½ to 4-in. double strength or I-beam mounting. The hoist is suitable for use as auxiliary equipment to handle loads that require short movement or that require handling until they are ready to be transferred to a tramway, traveling crane, conveyor or other equipment. Special hoists will be built to meet individual requirements.

R & S DIE HEADS and CHASERS GO TOGETHER

You know R & S Die Heads—

IN Want you to know R & S
Classes too! Only Hobbed Chases are securate enough for fine
theseling—R & S Chasers are
hebred—hardened and
proved to 1/2 of 1000th

Inch. Special steel to
toit special work. 40
years of experience is at
your disposal. Tell us about
Your toughest threading job.
R & S Chasers are made for a
long life of accurate cuts.

JUST LIKE YOUR LEFT and RIGHT HANDS

R&S Model F Die Head opens by pull-off method. A 1/4 turn closes the head to cutting position. Use Model F on turret or hand screw machines — or for any operation where the work revolves and the head is stationary. Write for data on all styles of R&S Die Heads.

The RICKERT ERIE,

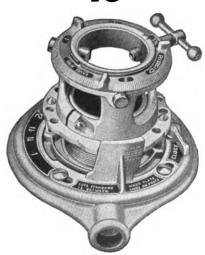
stable Imana Mand's; Call Insible Taps



Tapping Machines; Automatic Cut-off Machines

gitized by GOOGLE, Single Purpo-

ONLY 4 CHASER DIES INSTEAD OF 16



This PIPID No. 65R threads 1" to 2" pipe—without changing dies, perfect accurate threads. One set of 4 dies—no bother changing, forget the other 12 you don't need. You'll like this PIPID No. 65R. Write for folder, or see it at your Jobbar's.

THE RIDGE TOOL CO. Elyria, Ohio



All-Steel-Equip Group Locker

A steel group locker which will accommodate 16 persons in approximately one-half square foot of floor space per person has just been made commercially available by the All-Steel-Equip Company, Aurora, Ill. The new locker is called the A-S-E Unit-Robe. The Unit-Robe is made up of box locker units



All-Steel-Equip Group Lecker

12 in. wide, 12 in. high and 18 in. deep assembled in two vertical columns of si units each and connected across the toby a horizontal section of four unit Directly underneath is a coat hanger ro to accommodate the outer garments of or more persons.

The component units, which can is supplied with padlock attachment (with practically any type of flat key (locker combination lock, offer security for clothing, lunches, tools, shoes, hat wallets, and other personal effects (athletic equipment. The coat rod allow outer garments to hang full length with out folding or wrinkling and keeps the

★ Of particular interest to machine designers

The picture below, shows a machine called a Cylinder Looper, made by the Southern Textile Machinery Co. of Paducah, Ky. It is used for looping on the tops of socks and other knitted goods.

In designing this machine it was necessary to provide a means for driving the trimming mechanism from the main shaft around a right angle turn. Note how neatly the job was done with an S. S. WHITE FLEXIBLE SHAFT.

This problem of transmitting power between points which are not in alignment, comes up often in machine design. Next time you meet it, remember the flexible shaft. It's a thoroughly efficient, reliable solution—and so simple to apply.

We'll be glad to help you work out any such problem-without obligation. Just send us the details.

The S. S. WHITE

Dental Mfg. Co.

INDUSTRIAL DIVISION

10 East 40th St., Room 2310S New York, N. Y.

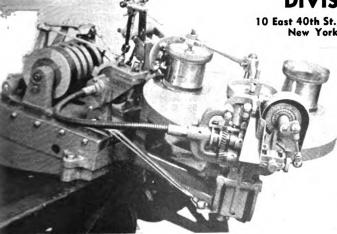


Photo courtesy Textile Machinery Co.

exposed to the air at all times.

Following established A-S-E locker design, the frame of the Unit-Robe is strongly constructed of steel channels and ½-in. steel angles, riveted together to make the complete section an integral unit, twist- and "weave"-proof. In common with other types of A-S-E lockers, Unit-Robes can be set up in single rows or back to back in double rows, and sections, though complete in themselves, may be "ganged" by bolting together in groups of any number.

Sanitation has been stressed in the Unit-Robe's design. Outer garments may hang free to the movement of air currents. Four standard locker louvers in each door allow ample space for the passage of air into the unit and, where the maximum amount of ventilation is needed and where contents must be available for inspection at all times, grilled steel doors are optional equip-The bottom of each unit has been made flush with the door frame so that the unit can be thoroughly As an inducement to the janitor to keep the front clean, A-S-E standard "torpedo-type" hinges are used on the doors. These hinges, which are practically tamper-proof, have the ends of the pins concealed in smooth embosses on the door front, offering no sharp edges to bark the janitor's knuckles or tear his cleaning cloth. Sweeping or scrubbing the floor under the Unit-Robe is made easy because there are legs under the vertical columns of units only, the rest of the floor space being left free.

Ward Leonard Voltage Regulators
Ward Leonard Electric Co., Mount
Vernon, N. Y., has developed and marketed two automatic electronic alternator voltage Regulators that perform
the same functions as do other and
older types of quick response regulators.
There are no moving parts in these
Regulators. Instead of relying upor
mechanical means to close contacts of
change pressures an inertialess stream
of electrons controls the regulating action.

The Regulators are controlled rectifiers deriving their power from the A.C. generator and delivering the rectified D.C. current to the shunt field of the exciter in an amount which is function of the A.C. generator potential. The corrective action of Bulletin 5601 Regulators starts within one-half

MELUFKIN RULF

LUFKINTAPES-RULES-PRECISION TOOLS

There's a reason for the popularity of /UFMIN Steel Tapes

For over fifty years they have been proven

— Accurate and Dependable —

Universally recognized as the Standard of Accuracy

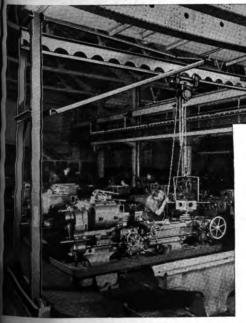
LUFKIN Steel Tapes are furnished in many patterns and markings and in all standard lengths.

Catalog No. 12 shows the most complete assortment of Tapes and Rules for all general measuring purposes. Send for free copy.

When You Buy a Measuring Tape, Insist on a JUFKIN



head Materials Handling



CLEVELAND TRAMRAIL

LIGHT-WEIGHT EASILY PROPELLED

Gantry Cranes

Single or Double Leg

Motor or Hand Operated

There are many times when the "big boys" the overhead cranes need a helper; when they are busy with the heavy loads - and someone on the assembly floor, on the molding floor or in the pit has a lighter lift to make—that is where the helper "A Cleveland Tramrail Gantry Crane" steps in.

There are many places where a Tramrail Gantry does the whole job -check Your route - see if they will not help your production schedule.

phone directory under Cleveland Tramrail. Consult your





THE CLEVELAND CRANE & ENGINEERING CO 1111 Depot St.

WICKLIFFE, OHIO

UNIVERSAL



FIRST COST 10% LOWER

EXCEPTIONAL LONG LIFE

MADE TO A. S. A.
SPECIFICATIONS

INTERCHANGEABLE

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LOW COST

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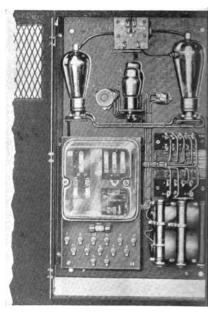


UNIVERSAL ENGINEERING CO. FRANKENMUTH, MICH.

cycle (1/120 second) of the slighte change in genarator voltage; and Bu letin 5602 Regulators start within or cycle (1/60 second).

cycle (1/60 second).

The Bulletin 5601 Regulator is designed so that it can be used with



View of Interior of Ward-Leonard Bulleti 5601 Voltage Regulator

any known method of excitation. The Regulator is now designated with an iso lated supply transformer making the larger capacities more easily arrange for switchboard mounting. The Buletin 5602 Regulator is designed fouse with one exciter only. It has a wide range of application, first in smaplants which have only one generating unit and second in providing individual regulators for plants operating two comore generating units in parallel. It is less expensive than the Bulletin 560

Variations of these Regulators ca be obtained to maintain constant volt age on 180 cycle generators, such a may be used to provide power for hig speed portable tools. Power Facto Regulation, etc. These Electronic Reg ulators, obtainable at a comparativel low initial cost, are easy to install, re quire no maintenance, or replacement except the tubes, which have long life

Dynamic AS WELL AS Static

One expects transmission equipment to be statically balanced, but Allis-Chalmers has now made, commercially available, a Texrope Sheave with the finest Dynamic Balance, for applications that require complete lack of vibration at all speeds. Not all applications require this extreme precision, but Allis-Chalmers has made it available for those that do, and the engineering ability capable of producing the Allis-Chalmers Dynamically Balanced Texrope Sheave is inherent in all Texrope equipment. • Allis-Chalmers engineers conceived and developed the multiple V-Belt principle, the Duro-Brace Texrope Sheave, Vari-Pitch Texrope Sheave, and now offer a new high standard in Dynamically Balanced Sheaves for Texrope V-Belt

Drives. If you want the finest and the most advanced multiple V-Belt transmission equipment, for every application, you want Allis-Chalmers Texrope Drives.

> Write for Vari-Pitch Bulletin No. 1261

Belts by Goodrich





Carboloy Company Presents Carboloy-Tipped Centers

Carboloy Company, Inc., 2975 East Jefferson Ave., Detroit, Mich., announces a special application of Carboloy on lathe and grinder centers. These centers are the same as regular steel cen-



Carboloy-Tipped Lathe Center

ters except that a Carboloy cone-shaped tip is substituted for the ordinary steel

Reports to date by users show that these centers wear 50 times longer than ordinary centers. A recent test shows this wear resistant quality of Carboloy: Using No. 72 steel shot at 100 lbs. pressure, a bar of Carboloy \(^3\kappa_1\). In square was blasted for 40 minutes. At the end of this period it showed no appreciable wear although its surface finish was slightly dulled. As compared to this, a bar of steel of the same size, and having

a hardness of 65 Rockwell "C", was blasted for the same period. At the end of 40 minutes 50 per cent of its area at the point of blast had worn away. This is an excellent indication of the extreme wear-resistant qualities of Carboloy comented carbide.

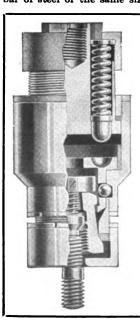
Because of their diamond-like hardness, cemented carbides are ideally suited to resist the extreme wear on lathe and grinder centers,—particularly where the work is nitrided, case hardened, or heat treated shafts. One report shows that on a turning operation, SAE-2335 steel shafting, Carboloy centers stood up 3 years with one regrinding whereas ordinary centers lasted only one week.

Besides its longer life, users report greater accuracy, elimination of burning and scoring, and fewer reconditionings. The centers are available in all sizes, finished complete, ready for use.

A descriptive leaflet may be obtained by writing the Carboloy Company, Inc. 2975 East Jefferson Ave., Detroit, Mich.

B & S Micrometer Attachment No. 280

The scope of usefulness of end measuring rods can be greatly widened by



TITAN STUD SETTER CONTROLLED DRIVE Assures Perfect Setting

The Titan Stud Setter has a safety clutch which controls driving power.

The Titan is positive in driving and automatic in releasing, thus making it possible to set the studs to any predetermined degree of tightness.

When the studs are driven to the specified tightness, the drive is automatically released and the tool may be removed without fear of mutilating or distorting the threads.

The great capacity, speed range, utility, and safety of this production tool make the Titan Stud Setter a profit-earning tool wherever it is used.

Write today for the new illustrated circular.

TITAN TOOL COMPANY

FAIRVIEW

PENNA.

WE ASK YOU--

Are your roughing inserted tooth face mills designed for **Maximum blade life?**

They would be if you were using

Jr & Jr

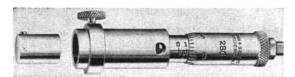
inside cone type design.



The adjustment is positive and uniform, making it unnecessary to scale each blade as it is set out, as well as being in the direction to compensate for major blade wear.

THINK IT OVER

GODDARD & GODDARD CO.
DETROIT, MICH.



B & S Micrometer Attachment No. 280

the use of the No. 280 Micrometer Attachment now being marketed by Brown & Sharpe Mfg. Co., Providence, R. I. The attachment is intended for use on rods that are % in. in diameter and when used with such rods makes it possible to determine sizes accurately to thousandths of an inch or closer in the sanths of an inch or citizer in the same manner in which any micrometer head is used. A group of %-in. end measuring rods, with this attachment, becomes for all practical purposes a re-liable inside micrometer with a range limited only by the number of measuring rods available.

The micrometer head has a movement With the 1/2-in. spacer plug, measurements in thousandths of an inch are thus provided from 1½ to 2½ in, longer than the end measuring rod The body of the attachment is long, assuring accurate alignment and rigidity. A hole permits visual check on the contact of the anvil with the rod. The measuring point is adjustable and is provided with a lock nut.

Tek-Lace Belt Fastening

A new method of belt lacing, on a diagonal line across the belt, has been made possible by Tek-Lace, a non-haz-



Tek-Lace Non-Metallic Belt Fastening

ardous, non-metallic belt fastening made by Sudbury Laboratory, P. O. Box 936, South Sudbury, Mass. The diagonal fastening increases the smoothness with



Thor STAMPS MORE MARKS PER DOLLAR

When you buy stamps you buy the marks they make.

Thor Stamps will give you "more marks per dollar" because of these features:
THUMB SIDE MARKING, easily read,
easily used . . . TURNED HEAD, gives a central striking point, save stamps . . . BLUE

HEAD, sign of correct individual heat treatment of special Alloy steel.

Send for our booklet, which tells you how to select and how to use steel stamps.

812 CANAL STREET

THE PITTSBURGH STAMP COMPANY PITTSBURGH, PA.

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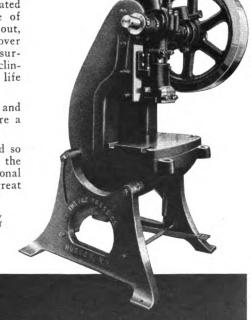
Smooth operation and maximum power assured by a heavy well-balanced flywheel.....

FLYWHEEL PINS—both driving and backing—are heat treated and seated deep in the hub. These pins are of square section and can be driven out, given a quarter turn and used over again. By providing four wearing surfaces, the flywheel pins in V & O Inclinable Presses have four times the life of ordinary pins.

A long bronze-bushed shaft bearing and a large diameter flywheel cap insure a smooth, true-running wheel.

Clutch jaw in the wheel is designed so that press can be backed up with the flywheel without using any additional accessory—a feature which is of great advantage in setting the dies.

Other advantageous features of design as a described in Catalog No. 37. A copy will be sent on request.



THE V & O PRESS CO., Hudson, N. Y.

RIVEY PRESTISS & CO.,
Rew York, National, Boston, Syracsis, Buffels
NAISHBALL & HUSCHART MACHINERY CO.,
Chicago and Milwauker
STIRLING, FRENCH MACHINERY CO. Detroit
ERNEE L. CIND. Philadelphia

WILLIAM K. STAMETS - PITTSBUTS AND CIRVAING ARTHUR JACKSON MACHINE TOOL CO. Turnfo and Montreal ELLIOTT & STEPHENS MACHINERY CO. - St. Lewis TIDEWATER SUPPLY CO. - NUTCHI and Romake, Ya. Co. Colomba, S. C. Aboutille, N. C.

O. S. MAIR MACHINERY CORP., Newton and Dailab JOSEPH F. PFLUM SALES ENGINEERING CO. Cincinnati, Ohio THE NATIONAL MACHINE TOOL & SUPPLY CO. MINERAPORS, MINE MEYER MACHINERY CO. . Los Angeles, Calif.





which the belt passes over the pulley, preventing wear and power losses, and giving the effect of endless belting with an easily applied fastening.

It is especially useful on high speed grinders and similar machinery where ordinary fastenings cause a bump that damages the finished work. It also prevents the necessity of patching belts with extra pieces when diagonal breaks occur.

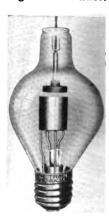
With its tensile strength of 200,000 lbs. per square inch, Tek-Lace is stronger than steel. Only 0.055 inch in diameter, it is more than 50 per cent stronger than Federal specifications for quarterinch rawhide. It sets flush with the surface of the belt on the pulled side, eliminating the bump that occurs when rawhide fastenings are used.

Recent manufacturing improvements have increased the strength of Tek-Lace.

and a new coating has added to its resistance against oil, water, wear and time.

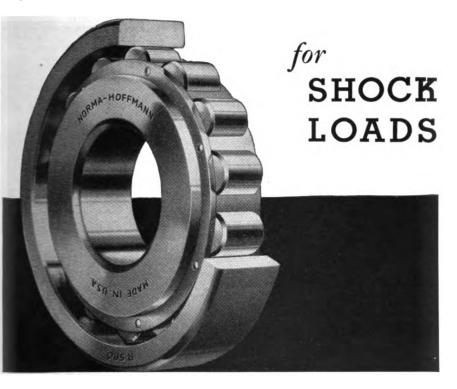
Continental Type 2-RA-15 Mercury Vapor Rectifier Tube

The Continental Electric Company of Geneva, Illinois, announce their new mercury vapor rectifier tube, which is known as type 2-RA-15. This rectifier has the following electrical characteristics:



Continental Type 2-RA-15 Mercury Vapor Rectifier Tube

and the like. The manufacturer guarantees 2000 hours life for this tube



DD shock load and vibration to an extremely severe steady load—and you have a set of conditions that tests the strength and endurance of any bearing. It is under such conditions that NORMA-HOFFMANN PRECISION ROLLER BEARINGS show their superiority.

Equipped with solid cylindrical rollers between cylindrical races, NORMA-HOFFMANN ROLLER BEARINGS provide maximum load contact area—which means correspondingly increased capacity for both steady loads and overloads, together with greater shock resistance than any other type of single-row bearing affords.

Moreover, they employ a heavy-duty, balanced, extruded bronze retainer—riding on the inner ring shoulders and relieving the rollers of its weight—that insures added durability. And their PRECISION qualities make them suitable for low and high speeds alike. . . . Write for the Catalog. Let our engineers work with you.

<u>"NORMA-HOFFMANN"</u>

PRECISION BALL, ROLLER and THRUST BEARINGS

when used within the limits shown above.

Samples are available to interested firms.

Seamless Steel Kantainer

The illustration shows a one-piece heavy gauge receptacle now being mar-



Seamless Steel Kantainer

keted by Seamless Products Co., Inc., 113 West 42nd St., New York, N. Y. This receptacle, known as the "Kantainer", is produced from high grade open hearth steel through successive cold drawing and annealing operations without any welds, seams or

rivets entering into its construction.

As a result of the drawn construction, the interior of the Kantainer is said to be as smooth as glass, without any chinks or crevices where rust could get

a start and without any seams to open

and permit leakage. This last feature is of particular importance to machine shops where Kantainers are used for handling the metal chips from the automatics or other machine tools, or for receptacles in which to convey part such as stampings and screw machine products. Any oil or coolant remaining on the chips or parts remains inside the Kantainer and it does not coose out onte the floor of the shop.

Nopco 1227-B Cutting Oil

A soluble cutting oil for use withigh speed machine tools operating under heavy feeds has been developed by the industrial division of the Nations Oil Products Company, Harrison, New Jersey.

This oil, to be known as Nopc 1227-B, cools as well as lubricates under the tremendous heat generated by machine tools in operation. It is used in turning, grinding, milling, drilling, light broaching, and other metal-working operations.

Nopco 1227-B is a combination of mineral and fatty oils treated in such way as to be immediately soluble in color warm water.

TOUGH ALLOY SHANK WELDED TO HIGH SPEED REAMER

Midwest LONG LIFE Expansion Reamers

Tach time a Midwest LONG LIFE Reamer is expanded to compensate for wear represents the complete life of a solid reamer of the same size. And a Midwest Reame can be expanded at least six times. Midwest Reamer Circular will point the way to cutting the cost of reaming holes from ½" to 3" dia. Send for a copy.

Midwest Tool & Mfg. Company

2358 W. Jefferson Detroit, Mirch



SHAPES

of abrasive products are necessary to get into those tight corners, to take off that roughness or to remove excess metal. In many cases the shape must be made to fit the work.

This illustration shows but a few of the special shapes Sterling makes for portable grinding of all kinds of materials. With plain holes, threaded holes, special mounting recesses we manufacture wheels in proper grain and grade for every purpose.

These portable grinding wheels are much in demand and you will find Sterling prepared to make just the wheels you want.

THE STERLING GRINDING WHEEL CO.

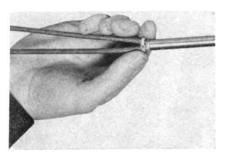
Abrasive Division of The Cleveland Quarries Co.
Factory and Office: TIFFIN, OHIO

CHICAGO: 912 W. Washington Blvd. • DETROIT: 101-107 W. Warren Ave.



Cartridge-Type Heating Unit For Smaller "Hot Spots"

Where a "spot" of heat is required within a limited space, a new small cartridge-type heating unit, recently an-



G.E. Cartridge-Type Heating Unit

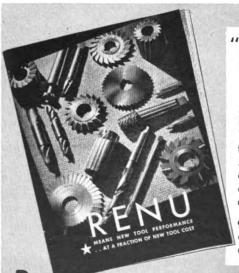
nounced by General Electric, offers many advantages. The new unit, the smallest of the G-E line, is only \(^3\) in in diameter and is manufactured with brass sheath for maximum operating temperature of 750 degrees F. It is especially convenient for built-in ap-

plications and can be quickly installe Is available in ratings of 30, 75 and 1 watts at 115 or 230 volts, A.C. or D.

Bridgeport Grinding Wheels

In addition to the grinding when which have heretofore been made. The Bridgeport Safety Emery Wheel C Inc., Bridgeport, Conn., especially it the types of grinding machines built this firm, The Bridgeport Safety Eme Wheel Co., Inc., is now offering higrade grinding wheels in the vitrif process, resinold process, and the silic process.

Bridgeport "Alumina" Wheels cont aluminous oxide grain and are suits for steel and metals of high ten strength. "Silexon" Wheels are made silicon carbide grain and are intent for use in the grinding of cast ir refractories materials, and metals of strength. tensile Bridgeport Spec "Alumina" Wheels contain special a minous oxide grain and are adapted the particular jobs requiring the hi est grade of refined grain. be furnished in the grain and grade (made with the bond best suited for particular job in hand.



"How's Business?" "Fine"

... and it should be, because Renu cuts tool costs 30% to 75% by making worn-out tools over into tools GUAR-ANTEED the equal of the original new tool—both for appearance and performance.

 A new catalog tells the complete story—write, no obligation.

Renti TOOL CO., 275 E. Milwaukee Ave. DETROIT, MIC

Alligator "V" Belt Fasteners

A fastener for joining "C" Section V-belts of fabric core, cross weave construction, is announced by the Flexible Steel Lacing Company, 4603 Lexington St., Chicago, Ill. The fastener makes practicable the installation, shortening or replacement of V-belts on the job without delays or the necessity of tearing down expensive installations.

Unique features of the Alligator V-Belt Fastener are the double rocker



Alligator V-Belt Fastener

pin supported in bronze bushings and the method of holding the end plate to the belt end without materially weakening the belt or bulging its sides. The rocker pin is made of special alloy steel hardened to give long listing service. No metal touches the pulleys. Application of the fasteners is rapid and easily made through the use of illustrated directions and tools supplied by the manufacturer.

The Alligator V-Belt Fastener was developed in cooperation with several railroads in the heavy duty services of axle lighting and air conditioning of passenger cars where it made an excellent service record. It has been tested and improved for several years and is now being supplied for general distribution.

Brown & Sharpe No. 5 Plain Grinding Machine

The No. 5 Plain Grinding Machine recently announced by the Brown & Sharpe Mfg. Co., Providence, R. I., is a new, small-size machine developed particularly for the rapid cylindrical grinding of duplicate small parts to close limits on a production basis. It is available in two capacities, 3x12 in. and 3x18 in., the shorter-table machine being recommended for installations where the work is not over 12 in. in length and minimum floor space is an important factor.

All operating controls and adjustments are grouped at the front of the machine, right at hand from the operating position. The recessed design of the base provides ample leg-room for the



"BEST FOR THE DAY'S LOAD!

True, you want cleaning that is thorough . . . low in cost. But you want something more . . . something grounded in experience . . . proved by performance. You want DEPENDABILITY . . . cleaning that will give you consistently satisfactory results today, tomorrow and every other day.

That's why Oakite cleaning is so often referred to as "sure-footed" cleaning. YOU CAN RELY ON IT!

Are you up against any problem in cleaning before plating? Want to reduce wiping and brushing operations? Are you able to remove japan, enamel or lacquer as economically as you would like to?

These are the jobs on which "sure-footed" Oakite cleaning points the way to improved product . . . to low costs. Write for specific information on your work.

Manufactured only by OAKITE PRODUCTS, INC.

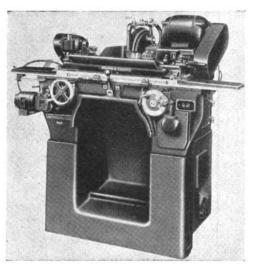
36 Thames St. New York, N. Y. Branch offices and Representatives in all principal cities of the U. S.

OAKSTE SPECIALIZED INDUSTRIAL CLEANING MATERIALS & METHODS

gitized by Google

operator to sit comfortably at the machine; while the convenient height of the table and controls provides for equally efficient operation from a standing position.

The headstock and coolant pump are started and stopped electrically by rotation of the cross feed handwheel, start-



Brown & Sharpe No. 5 Plain Grinding Machine

ing automatically when the grinding wheel is advanced toward the work and stopping when the wheel is withdrawn to unloading position. This feature, in combination with the headstock brake, aids materially in maintaining high production schedules. A lever permits cutting out the headstock and coolant pump motors when wheel-truing or setting-up. An additional aid to rapid pro-

duction consists of the table trayhandy place to put work pieces, do and tools.

Wheel spindle, headstock, table an coolant pump are driven by separat motors, a push button station at the front controlling the starting and stopping of the entire machine. All elec-

ping of the entire machine. All electrical control units are built into the machine, and are well protected, yet easily accessible. A automatic oiling system lubricate the wheel spindle bearings, the cross feed screw and full nut, the table and cross slide ways and the table driving mechanism of the machine. The coolant tank integral with the bed casting, and has removable cover and band plates. The centrifugal motor pump is also removable, to facilitate cleaning of the coolant tank

Rockford 12-In. High Speed Hy-Draulic Shaper

The illustration shows the 12-In High Speed Hy-Draulic Shapes which has been brought out by Rockford Machine Tool Co., Rockford, Ill. The feature of the machine is the hydraulic drive which provides an infinite variety of speeds up to 150 ft. per minute and an infinite variety of feed ranging from 0.0025 in. to 0.096 in. and also provides the smooth drive which results in high-grade

workmanship. Adjustment of feed is as easy as setting a radio dial. The hydraulic drive for the feed is absolutely without shock and the operation of the feed is independent of the rain drive. The feed has few moving parts small power consumption and a large safety factor.

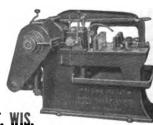
Smooth flowing oil under tremendous pressure constantly drives the ram to 1t

RACINE

METAL CUTTING MACHINES

"Standard the World over"

RACINE TOOL AND MACHINE CO • RACINE, WIS.



THOSE HIDDEN COSTS...NOW ARE PROFITS!

The correct oil film to each individual bearing . . .

automatically

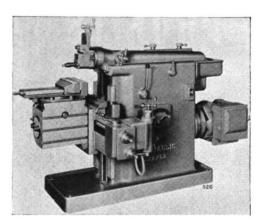
AUTOMATICALLY Correct LUBRICATION

Remember them? Oiling time lost from productive work . . . Lubricant wasted . . . Production delays . . . Increased depreciation.

• How those hidden costs gnawed at profits! Money that now is clear . . . simply by the convenient, economical use of BIJUR lubricated machines. Clean lubricant is pumped and fed automatically...to each bearing the correct oil film it individually requires. No lubrication troubles . . . even to think about! BIJUR LUBRICATING CORPORATION

LONG ISLAND CITY, NEW YORK

BILISS



Rockford 12-In. High Speed Hy-Draulic Shaper

work and also acts as a shock absorber when the tool enters the cut, meets a hard spot or a lump.

A single control starts the ram and stops it instantly without shock or coasting and also governs the selection of high or low cutting speed ranges. Duplicate levers on opposite sides of the column increase operating convenience. The length and position of the ram stroke is easily adjusted without stopping the ram or using a wrench or crank. The direction of ram movement can be reversed The machine column instantly. is integral with the base and houses the hydraulic equipment and oil reservoir. The motor is end-boss mounted, off the floor and out of the way. Adjustment of the hydraulic table feed is convenient, but the table is rapid traversed easily by hand. Bearing surfaces are protected by heavy guard. Standard equipment includes a universal table with a tilting top. The top tilts 15 deg. either side of center and the table has 360 deg. adjustment and a powerful lock. A swivel base vise with a single screw and steelfaced jaw is also provided.

clapper box adjustment has a vise-type clamp. Power cown-feed is provided for

the head.

The length of the stroke can be varied from ½ in. maximum to 13 in. maximum. Maximum number of strokes per minute, 400. Vertical travel of table, 14 in. Maximum distance, table to ram,



FINGERTIP CONTROL

is exemplified in the Hamilton Auto-Shift Table Units shown here in silhouette. The board is instantly and easily adjustable to any height or slant. The back of the table is an auxiliary working surface for the man ahead. Reference data, at his fingertips, is kept in the well arranged table drawers. In-

vestigate the efficiency of "finger-tip control" in modern drafting equipment today. Mail the coupon below.





HAMILTON MANUFACTURING COMPANY Two Rivers, Wisconsin. Dept. MS 8-37

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Name					т	Title		
ĺ	Firm	Name			, . 			

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Leading shops throughout the country are sav-ing many dollars and hours on scraping with ependable, efficient ANDERSON POWER SCRAPERS.

Important features: PORTABILITY—can be testly moved about and made ready for use at any light socket. FLEXIBILITY—Smooth, steady stroke. Scraper can be adjusted simply me quickly from a fraction of an inch to a ties of the scraper ram is as natural as using hand scraping tool. Machine is extremely

sensitive and responsive. BLADE GRINDERsensure and responsive. BLADE GRINDER—Conveniently mounted on pedestal enabling operator to constantly keep the blade sharp without leaving the work. AUTOMATIC SAFETY CONTROL—shuts off current when motor is unduly overloaded.

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ANDERSON BROTHERS MFG. CO.

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ILLINOIS

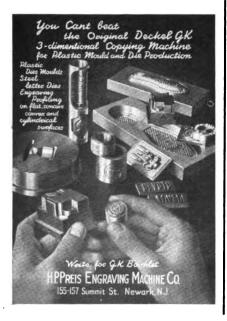


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CIRCULAR TOOL CO., INC.

767 ALLENS AVE. PROVIDENCE, R. I.

Branch Offices
CHICAGO DETROIT INDIANAPOLIS
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tilting top, 17½ in. Maximum distartable to ram, plain side, 19½ in. Frange for power down-feed, 0.0025 0.030 in. Size of table top, 10½x12 Range of cutting speed in feet per sute, 5 to 150. Maximum ram relatio, 2:1. Motor recommended, 5 in 1200 r.p.m. Net weight with motor, proximately, 3000 pounds.

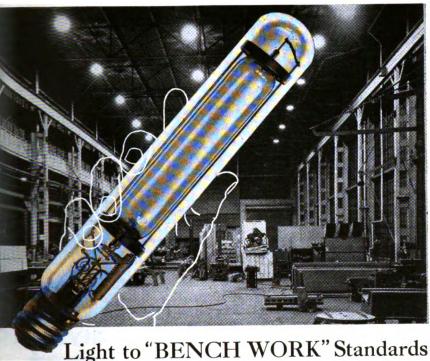
American Type H Horizont Hydraulic Broaching Machin

The illustration shows the Amer Type H Horizontal Hydraulic Broac Machine, product of American Broac Machine, product of American Broac Machine Company, Ann Arbor, The machine is built in five sizes handle any internal broaching of tion and a variety of surface broac operations. The machine is simple design, constructed of high grade terials and incorporates principles, tures and advantages which have developed during many years of plor ing in the broaching field. Stan hydraulic equipment is installed the minimum of connections and at taken to insure reliable open throughout years of heavy duty

The bed is of heavy box sections. ribbed throughout to provide right port for all machine members. It tains large separate reservoirs for draulic oil and coolant. The stan frame motor is directly connected to hydraulic unit by means of a fie coupling supplied with the mac The motor is protected against entidirt and chips.

The pumping unit is continued submerged in hydraulic oil. The undertailed power provides an invariety of cutting speeds which are trolled by a conveniently placed and a graduated dial. A fan-type sure gage, protected by a stopenables the operator to check the sure in the hydraulic system queasily and conveniently.

The hydraulic cylinder is solidicured to the bed under the pislide, thus conserving floor space. cylinder bore is extremely accurate. piston head and stuffing box are cislly constructed to provide smree, leak-proof operation. The long pulling slide is a distinctive for this machine and is designed to mote smooth cutting, continumaintained alignment, and long The hardened steel ways are accu



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By combining Mercury and Incandescent Lamps in many conventional type luminaires, a psychologically cool, white light can be

Here, 400-watt mercury lamps mounted above the craneway give high and uniform illumination at low operating costs. No other comparable light source gives as much light per watt as these modern lamps. "Bench work" standards of lighting are maintained even in the high bay.

Better lighting through the use of mercury lamps is a profitable procedure. Better light is a production "tool" which directly improves the efficiency of every worker and every other production tool used in industry.

If you are interested in more uniform products at less cost it will pay you to investigate the possibilities of Type H General Electric Mercury Lamps. Complete information is yours for the asking.

GENERAL MELECTRIC

General Electric Vapor Lamp Co. 897 Adams Street, Hoboken, N. J.

Incandescent Lamp Department Dept. 166, Nels Park, Cleveland, Ohio

rder your auxiliary devices which were deined especially for this lamp from the eneral Electric Vapor Lamp Co.

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A coplous support coolant is supplied by the certifugal p u m which operate with direct-connected motor drive. A heavy steguard confines the chips and coola and also protect the work and broach. The ch

ground and located, providing a durable mounting for the pulling slide.

An automatic pressure lubricator operates at each stroke of the slide to draw oil from the reservoir and force it to during set-up is easy with this sensiti-

The pulling head on the slide is privided with vertical adjustment white facilitates set-up and insures accurations straight-line pu



American Type H Horizontal Hydraulic Broaching Machine

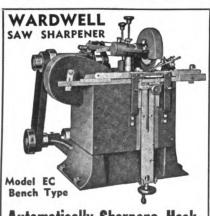
each of the hardened and ground ways. Four wipers on the slide protect bearing surfaces and promote lubricaton. A conveniently located lever provides the operator with accurate, sensitive control of the slide movement. A safety detent holds the lever in vertical neutral position. Movement of the lever either slde of vertical results in slide movement in the same direction. Inching the slide

chute through the front of the beconducts chips at coolant to an interior compartment where chips fall into a receptacle at coolant drains into the reservoir. The chip compartment opens on the side the machine away from the operator thus chips may be removed without interfering with production.

The capacity of the American Type Machine at normal is as follows: Type 6-36, 6 tons; Type 6-48, 6 tons; Type

RIVETERS

GRANT



Automatically Sharpens Hack, Band & Circular Saws

with teeth as fine as 32 to the inch, at a speed of 30 to 75 per minute. WRITE FOR CIRCULAR

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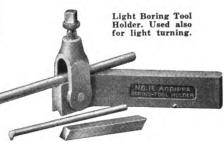
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Straight Turning Tool Holder

AGRIPPA" Tool Holders by Wiliams are so designed and made as to dd speed, efficiency and greater profit to every regular operation of lathe, laner and shaper. All are droporged, carefully broached, accurately aschined and specially hardened. Agrippa" construction assures a solid auter seat and a chatter-proof, cleanuting tool. For better cutting at ower cost—choose "Agrippas", they out no more than ordinary holders.

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leadquarters for: Drop-Forged Wrenches Carbon and Alloy), Detachable Socket Wrenches, "C" Clamps, Lathe Dogs, Tool Bilders, Eye Bolts, Holst Hooks, Thumb Kuts and Screws, Chain Pipe Tongs, Vises, tc.



10-48, 10 tons; Type 15-60, 15 tons; Type 20-60, 20 tons. The strokes are 36, 48, 48, 60 and 60 in., for the five sizes of machines respectively. Maximum overall broach lengths are 44, 56, 56, 69, and 69 in. respectively. Motor recommended, normal, 7½, h.p., 1200 r.p.m. for Types 6-36 and 6-48; 15 h.p., 1200 r.p.m., for Type 10-48; 20 h.p., 1200 r.p.m., for Type 15-60, and 25 h.p., 1200 r.p.m., for Type 28-60. Floor space required, 2½x8 ft., for the smaller sizes and 3x12 ft. for the larger sizes. Height overall, 42 and 44 in. Weight, net, 3600, 4100, 4150, 4700 and 4750 pounds.

Taber Abraser

The Taber Instrument Company, North Tonawanda, N. Y., announces the Taber Abraser, a precision testing machine for measuring the wear resistance, toughness, adhesion and rub-off qualities of surface finishes such as enamels, electroplate, anodizing, linoleum, molded plastic sheets, and leather coverings.

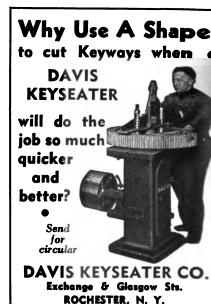
In the research laboratory, the Taber Abraser is said to be indispensable for testing new formulas, control work, checking competitive samples, grading, and so on. Its lightness and portability make it possible for traveling sales tech-





Taber Abraser

nicians to prove their claims and check competitive materials on locating According to the manufacturer, commanders and cerns making products that require tough, wear-resisting finish will fithat the Taber Abraser renders impact that the type tant service in determining the type





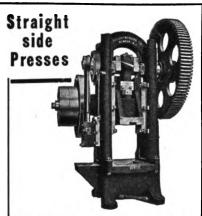
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Outstanding in every detail for heavy blanking and forming work. All stresses are taken centrally. Write for new catalog illustrating and describing this and other presses.

Zeh & Hahnemann Co.
184 Vanderpool St. Newark, N.

Do you want to cut your grinding and polishing costs as much as 50 %?



TME "OLIVER" GRINDER AND POLISHER CAN DO IT . . .

This compact ball bearing, horizontal belt surfacer and polisher is fine for finishing bronze tablets, aluminum and brass castings, etc. Has features of larger costly machines with greater convenience and efficiency on work in its capacity. Write for details.

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OLIVER MACHINERY COMPANY
Grand Rapids, Michigan

enamel, number of coats, or thick of finish necessary to meet requireme

In general, the Taber Abraser is adaable for testing practically every type enamel, lacquer, or other non-tacoatings including electroplated anodic finiskes. Test to determine comparative cutting efficiency of abrapaper and cloth can also be made.

Hammond Grinders Employ Cooled Motors

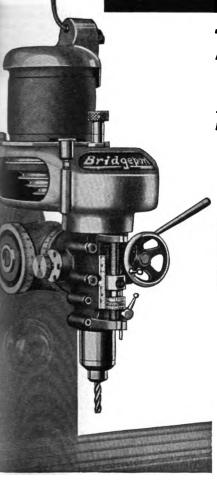
The Hammond Machinery Build Inc., Kalamazoo, Mich., has equipped of its grinders of 3 h.p. and over we totally-enclosed, fan-cooled motors. illustrated, the rotor and stator on the units are in an enclosed chamber see against the entrance of foreign mat



Hammond Grinder With Fan-Cooled Mo

Two fans force cooling air around outside of this chamber, serving to tract heat from the motor.

The fan-cooled type motor is said withstand greater overload with a low temperature rise. The company's grir ers are equipped with automatic start with thermal overload protection, ov size ball bearings, adjustable eye shie made of shatterless glass and push but ton remote control.



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THE BRIDGEPORT '' M A S T E R''

HIGH - SPEED Milling, Drilling and Boring

AT ANY ANGLE

SAVE

On End Mills.
Hours of Labor.
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working with old
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Special fixtures, Angle
Plates and Vises.

After seven years of continuous service The Bridgeport Attachments are still giving the same matchless performance. One company alone has forty-five of these machines in use in their die sinking departments.

A number of concerns use from ten to fifteen machines each for tool and die as well as production work.

We doubt if we can overstate the value of the Master Attachment for the small tool shop where a unit of this type will solve

ET US tell you where a Bridgepert High Speed Milling Attachment may be seen appearation. Your time in viewing this equipment will be well spent.

Write for Illustrated Bulletin.

BRIDGEBORT PATTERN & MODEL WORKS

M-B Pre-Determined Feed Machine Oiler

The oiler shown in the illustration is now being offered to the trade by M-B



M-B Pre - Determined Feed Machine Oiler

Products, 130 E. Larned St., Detroit, Mich. The outstanding feature of the M-B Pre-Determined Feed Machine Oller is its method of metering or measuring the oil feed which is said to be a radical departure from conventional methods, both as to principle and consequent reliability.

It is said that the oiler will continue indefinitely any pre-determined feed, without variation from the set rate. The oiler is adjusted to the set rate. The oiler is adjusted to the set rate.

rate. The oller is adjusted for one drop of oil per minute, or more or less as desired, before leaving the factory. The oil capacity is sufficient for an eight-hour shift, whether oils of 150 to 250 viscosity argused or the lighter oils of 90 to 100 viscosity. The oiler mechanism is sealed

against dust and dirt.

The M-B Oiler is said to be designed and built to withstand hard usage, is made from heavy gauge steel stamping, the upper shell providing an efficient guard for the glass and the rour ports giving ample visibility. The steet stud and lower sight feed container a very sturdy and relatively immune from breakage. Neither the patented metering pin nor any other part of the oile is subject to wear or depreciation, a though it can easily be disassembled desired.

Mathews Conveyor Roller with Type 47-SB Bearings

To meet the increasing demand to heavy duty roller conveyors in various branches of industry, The Mathews Corveyor Company, Ellwood City, Pa., hadded to its standard line a newly developed roller. This roller incorporate 3½-in. O.D. seamless steel tubing, 5/16 in. wall, .30-40 carbon. The bearing applied, identified as Type 47-SB, is newl designed, having steel inner and outer labyrinth seals, hardened inner an outer ball races, and 13-9/16-in. diam eter hardened steel balls, assembles

IDEAL SPEED LATHES



FOR LAPPING FINISHING POLISHING

SMALL PARTS
2 Speed Motor.
Automatic Brake.
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LINLEY NOISELESS ROTARY
RIVETING MACHINES
Assure Peak Production and

Assure Peak Production and Lower Maintenance, Rigid and Powerful Bench and Floor Types. Motor or Belt Driven. There is a Linley machine for every riveting job.

Send Samples of your Work and we will furnish accurate estimate of production and quote cost of equipment. LINLEY BROTHERS CO.

583 Fairfield Avenue Bridgeport, Conn., U. S. A





500 lbs. to 35 tons pressure

HYDRAULIC, MOTOR DRIVEN, HAND OPERATED

Greenerd Arbor Press Co., Nashua, N. H.







within a pressed steel jacket. The assembled roller has an average rated capacity of 2200 pounds.

A hexagon axle is applied in this roller, providing a positive means of locking



Mathews Conveyor Roller with Type 47-SB Bearings

the inner ball race and the axle, thereby The axle is drilled at the ends, and grease fittings applied, making period lubrication a simple matter. Cotter keys hold the roller firmly in the frames.

The roller can be furnished in lengths ranging from 6 in. up to 48 in., and can be spaced in the frames on centers ranging from 4 in. up. Channel or angle frames are generally used in the construction of conveyors incorporating this roller. When the rollers are placed

low in the structural frame, the top the frame functions as a guard rail the commodities being conveyed.

Portable Tools Use Portable Por

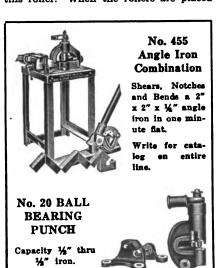
The lack of the usual central stat electric current supply is no longer hindrance to the use of Black & Dec portable electric tools, as shown in accompanying photograph of a Black Decker No. 34 Electric Hammer be operated from a portable gasoline dri electric generator made by the Home Corporation, Port Chester, N. Y.

Black & Decker Mfg. Co., Towson, & design and build all of the motors their tools and the one pictured equipped with a universal motor, built as to operate on either altern

ing or direct current.

The special design of these mot permits their use on a portable election generator as well as on the large cent station supply lines. While the curre supply in this case is really a miniatu the Black & Decker motor delivers same powerful action to the tool though it were operating from a cent station supply line

Drilling, hammering, grinding, sar ing and sawing are only a few of



WHITNEY METAL TOOL CO.

110 Forbes St.

Rockford, Ill.

CYLINDRICAL SUB - PRESSES

Are especially desirable for producing clean cut, accurate parts with compound dies. For after operations, swaging, piercin g, trimming, etc., the over-hang type is preferred. We have had a long experience i n making such dies. Please send us samples or drawings for es-



ARCH TYPE

Waltham Machine Works WALTHAM, MASS.

If you need a Set Screw with



Guts specify-



HOLLOW SET SCREW

Even under the severest punishment, "UNBRAKO" Hollow Set Screws hold fast and stay put. Made of alloy steel, properly heat-treated-they're tough and hard so points don't mushroom and hex won't round. Details on request.

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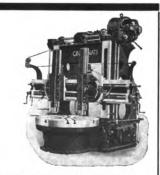
THIS
MACHINE
GRINDS
POLISHES
SURFACES

The Type R machine is a combination of three machines—a disc grinder, a polishing wheel, and a belt surfacing machine. Three men can use it at the same time.

If space and power are important factors in your shop, it will pay you to investigate this money and time saving machine.

Write today for details.

Production Machine Co.



VERTICAL BORING MILLS PLANERS, Double Housing, Openside

CRANK PLANERS
PLANER TYPE MILLERS
WRITE FOR BULLETIN

THE CINCINNATI PLANER CO.

jobs that can now be done "on lo tion" whether it be on the highwas by-ways or on the farm—and all of th tools in the Black & Decker line h



Using a Black & Decker No. 34 Elect Hammer powered by a portable power use consisting of a gasoline engine and elect generator.

the universal motor mentioned above standard equipment ready to use portable generating equipment.

Rochester Metal Dryer

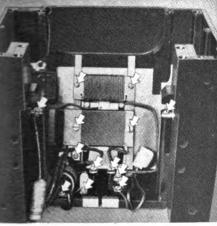
The illustration shows a new type Rochester Metal Dryer which has been placed on the market by Rochester E gineering & Centrifugal Corporation, I Buffalo Rd., Rochester, N. Y. The michine shown is equipped with division plates in the perforated Monel met basket for the purpose of separating different types and sizes of screws, bolt and small-metal parts. This design is a davantage where production is desired but where it is necessary to keep segarate—in order to maintain the max mum efficiency—the articles making used in the single load.

The basket of the machine is removable; thus it may be lifted from th

An Assembly Method that helped MAKE "A \$250 PRODUCT" TO SELL AT \$85 hould be worth investigating for your work

AT ONE TIME doctors had to pay from \$250. to \$700. for a Cold-Cautery-Scalpel. low they can get this efficient and reliable Wappler" instrument for only \$85. Even e country practitioner can own one since merican Cystoscope Makers, Inc., applied production principles and intelligent bought to the design of such equipment. In this achievement the maker states that arker-Kalon Hardened Self-tapping Screws layed an important part. "They enabled us save quite a sum on the cost of molds beuse inserts in the plastic parts could be oided . . . They simplified the attachment parts to the molded housing, saving much sembly labor and greatly increasing prouction speed . . . The fact is that stronger stenings also were secured, for these





unique Screws hold more securely than machine screws in either inserts or tapped holes." It is no wonder that this manufacturer says—"Now when an assembly is to be made on any of our products we first consider Hardened Self-tapping Screws."

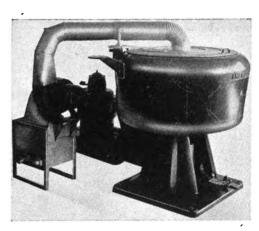
Let us help you investigate this cost-cutting method of assembling metal and plastics

On your own work it is likely that fastening jobs could be simplified and economies effected by using Hardened Self-tapping Screws in place of ordinary devices. In 7 out of 10 cases where metal or plastic assemblies are required this method can be used to advantage for all or part of the fastenings. A Parker-Kalon Assembly Engineer will call on request to go over your fastenings with you and point out all opportunities. A letter to us obtains this service without obligation.

PARKER-KALON CORPORATION
Dept. M, 198 Varick Street
New York, N.Y.

PARKER-KALON Modern FASTENING DEVICES

176



Rochester Metal Dryer

unit and conveyed to the department in which the work-pieces are to be used. It is then reloaded and returned to the machine for the next run. By using two baskets, the machine may be kept

in practically continuous operation.

The dryer is equipped with a compact steam-heated unit for circulating

hot air through the load to con plete the drying operation af centrifugal force has disposed the surplus moisture. The use centrifugal force provides the fa est and most economical mes for removing the surplus moists from the parts being dried. T motor driven unit is powered vertically-mounted special tractor motor which transmits t power by means of a silent, po tive V-belt.

"Ready" Quick Acting Car Grinder Dog

The drawing illustrates c tailed design of a quick acticam grinder dog which has be developed by The Ready To developed by The Ready Company, Bridgeport, Conn. T feature of this dog consists

that the operator can handle with one hand quickly, it is positi in action, has a wide range of adjument, and does not require the use of wrench except when changing to wo of a different size.

The work is held in the dog by to setscrews and a quick acting cam whi acts as the tail for driving. When t



TOOL & DIE WORKS Est. 1912 Springfield, O.

GEARS

Spur-Helical-Worm-Bevel or Specia Gears

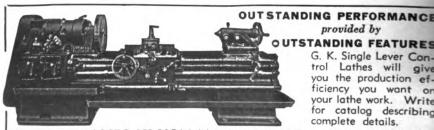
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Surface External

Internal Lapping We do splining and broaching, also. 25 year of serving the machine trade guarantees you our quality of work and prompt service.

We solicit your inquiries.

THE TAYLOR MACHINE COMPANY 1919 E. 61st St., Cleveland, Ohlo



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G. K. Single Lever Control Lathes will give you the production efficiency you want on your lathe work. Write for catalog describing complete details.

GREAVES-KLUSMAN TOOL CO., Cincinnati, O.

20% <u>More Plant Space</u>



AT NO COST!

"We made the change to save both tools and time," reports Watson Machinery Company, (Paterson, N. J.) after replacing wood racks and counters with Lyon Tool Cribs. Drills, reamers, jigs, dies, etc., are now located quickly and readily. But also over 20% of former storage space is available for other purposes. Costs for lost tools and damage are greatly reduced. Saving of time and increased efficiency will quickly pay for the new Lyon Steel Storage Equipment. Similar savings and improvements may be possible in your tool room and stock room. Send coupon for Bulletin describing Lyon Tool Cribs and other money-saving storage equipment.

LYON Service

LYON METAL PRODUCTS, INCORPORATED, Aurora, Illinois

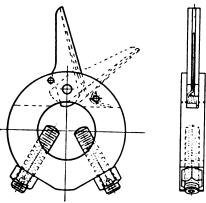
YON	MET	AL	PRODU	CTS,	Incorporated,
308	River	St.,	Aurora,	111.	

Please send () Bulletin 105-C, Lyon Steel Tool Room Equipment.

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Addres	s	 	 	 	 	_	 	 	 	 	 _

y_____State_____

screws are properly set, the work is gripped between the screws and the cam, the pressure of the driver serving to clamp the work sufficiently for opera-



Drawing illustrating design of Ready Quick Acting Cam Grinder Dog

tion. As the pressure of the wheel against the work is increased, the pressure of the driver against the cam in-

creases in proportion, insuring that work will be revolved regardless of amount of wheel pressure.

Although the work is instantly digaged, the cam is held by a sprin contact with the work so that it not become disengaged after once properly located. The design of the is such that it is practically alwabalance. Inasmuch as the setscrett inserted on an angle of 60 deg., affect three-point contact on the wobtained regardless of the diamethe work. The dog is made in four to handle work from ¼-in. to diameter.

Economy Abrasive Holder
To facilitate the operation of h
polishing with abrasive cloth, in
Manufacturing Company, 2410 8.
Ave., Chicago, Ill., has brought
line of abrasive holders. consist
four different shapes, for holding
sive cloth or paper while polish

The holder is made of 0.025 cold rolled sheet steel, tin plate a comfortable and smooth grip handle. The overall length holder is 13¼ in. The metal 19¼ in., tapering slightly from





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Gallmeyer & Livingston Co.
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GRAND RAPIDS, MICH.

Sebastian Motor Brive Attachment For Cone Head Lathes

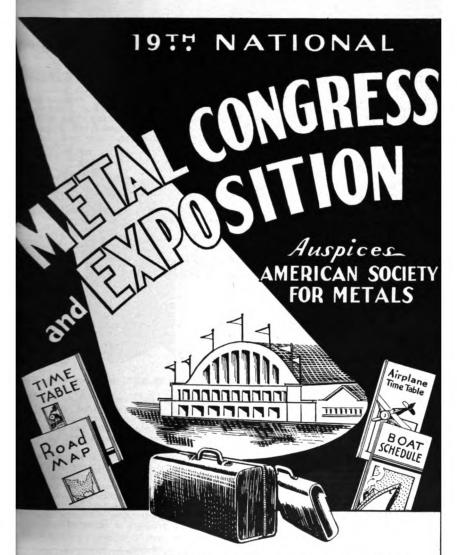


• For any make of lathe from to 20" swing. Does not obsevision. Easy to attach—low in pr

> 12" SIZE...... \$ 65.00 16" SIZE..... 75.00 20" SIZE..... 105.00

The Sebastian Lathe CINCINNATI, O.

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Spotlighted at Atlantic City, the feature attraction of the year for metal men promises to play to its biggest audience. The five-day program is packed with information and exhibits of the newest and best in the metal industry. Be on hand when the curtain goes up . . . you'll find the "Convention City" an ideal setting for metal's great show.

ATLANTIC CITY Auditorium OCTOBER 18 TH 40.22 2 1937

to the grip. The holder, though sturdily constructed, weighs only 3½ ounces.

The shank is slotted the full length to accommodate quick and efficient interchanging of abrasive cloth and paper which can easily be silpped on; thus the abrasive cloth or paper is held firmly and snugly to the shank. The holders are made in four shapes; round, square, triangular and flat. Abrasive refills are obtainable in all types and grits. The holders are packed singly, in individual cartons, and in a larger carton containing the set of four.



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GRIND YOUR SPLINE SHAFTS

under contract with our new Type B Spline Grinder.

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GRINDING MACHINE
CORP.

FITCHBURG,

MASS.

Armglo Resistance Welder

Two thousand welds an hour is speed claimed for the Armglo Reacted Armglo Company, Milwaukee, Wis. welder is of the press type, autor cally controlled, and has been devel



Armglo 35 KVA Resistance Spot We

especially for use in the welding stainless steel, galvanized coated, mium plated, and Terne-plate well-However, the unit can be used for kinds of non-ferrous as well as ordisteel metals.

Absolutely uniform welds are guateed by the manufacturer of the chine and it is said that the mac produces welds showing no apprecideterioration of surface on either A saving of at least 30 per cen claimed in dressing electrode tips welding pressure is adjusted quickly



Sizes 16" to 36" Swing

full line of Gap Lath 16" to 50" swing. Write for complete Information.

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How industrial advertising men can do a more effective job will be the main theme of the 15th Annual NIAA Industrial Advertising and Sales Promotion Conference and Exposition to be held in Chicago, September 22, 23, 24, 1937.

Inspiration, practical new ideas, the low-down on what the other fellows are doing to meet the complex promotion problems of today — they'll be given you in abundance by nationally known industrial leaders, sales executives, advertising directors. There'll be speaking sessions, round-table discussions, clinics, exhibits of the newest in advertising and sales promotion materials.

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NATIONAL INDUSTRIAL ADVERTISERS ASS'N

H. D. PAYNE, CHICAGO MOLDED PRODUCTS CO. 2145 West Walnut Street, Chicago, Illinois casily by merely setting one nut at the rear of the welder. The welder is equipped with a positive tap changer. All electrical controls such as the timer, magnetic contactor, tap changer, and all power current carrying parts are completely enclosed in the base of the welder. Removable special alloy water-cooled welding tips are standard equipment. Reversible horns are optional.

D-R "A" Die Cushion

The Dayton Rogers Manufacturing Company, Minneapolis, Minnesota, has



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labor and materials already in the piece of work. Made in

two, three and four flute styles.

THE WALTON CO. 98 Allyn St. Hartford, Conn.

D-R Model A Pneumatic Die Cushion

announced a new model "A" pneums die cushion especially designed for clinable presses. These cushions made in seven sizes and have a draw capacity from 2½ inches to 5 inches This new design includes a hand wh

This new design includes a hand wheal and hand wheel stop for adjusting a predetermining the height of the piss pressure plate at all times. This descan be used for all drawing and for ing die actions as well as to control stripping actions on compound blank and piercing dies. It readily replasprings and rubbers on dies already use. This cushion is a self-contain portable unit that is directly connect to the air line. The cushions open on an air line pressure from 20 to 1bs. and will produce a draw ring ho ing pressure from ½ ton to 8 to This pressure may be controlled by a regulator and recorded on the gauge







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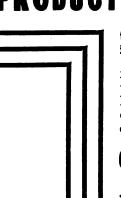
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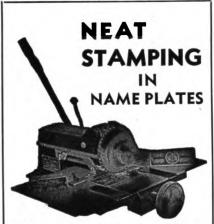
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This machine quickly stamps details and serial numbers into name plates.

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No. 48-30 STEEL BENCH

Suitable for any kind of shop work. Heavy, rugged and rigid. Can be used singly or joined together for continuous benches. 12 gauge steel top and shelf. Sizes: 4 feet, 5 feet and 6 feet wide, right to left; 24 inches and 30 inches deep, front to back. Drawer: 20 inches wide by 18 inches deep by 5 inches high, with sliding tray.

A COMPLETE LINE OF STEEL FACTORY AND SHOP EQUIPMENT

Write for catalog "EJ"

ANGLE STEEL STOOL CO.

Chromium Plating Service For Gage Blocks

A specialized chromium plating service is available to users of steel gage blocks through the establishment of the Dearborn Gage Company, Dearborn Mich. This concern specializes in the application of chromium plating to the surfaces of gage blocks both to aid in preserving the accuracy of the block and to prevent the possibility of rus corrosion.

The Dearborn Gage Company is in an ideal position to offer this specialized service. The precision finishing operations are under the guidance and direction of Elmer Elistrom, son of Hjalma Elistrom who was associated with the early manufacture of the gage block system. The first set of chromium plated gage blocks finished by the Dearborn Gage Company was recently delivered to the Lincoln Tool and Die Company, Detroit, Mich. The chromium plating equipment in use at the Dearborn Gage Company was designed by the United Chromium Company and supplied by the Udylite Company of Detroit, Michigan.

Geneva Universal Holder

Chicago Dial Indicator Co., 180 N Wacker Drive, Chicago, Ill., has brough out a special holder for Geneva Precision



Geneva Universal Holder

Dial Indicators, as shown in the illustration. The holder is said to increasthe convenience and thus the speed of the work. It is compact, of simple design and easy to use.

STOP BELT SLIPPING!



VACUUM CUP METAL PULLEYS

Quaranteed to: Eliminate belt slippage and power loss . . . Increase life of belts and squipment . . . wear indefinitely . . . keep belts from flying off. Belt is sealed to pulley at vacuum contacts. Order now on 20 Day Free Trial Offer. Used in many of the largest plants.

Vacuum Cup Metal Pulley Co., Inc.



NEW BXB HIGH SPEED POWER SAW

Gravity Food Longth Gauge Expanding Clutch Automatic Stop

Automotive Relieving Device Dovetailed Saw Frame Guide Write for Bulletin.

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A Cost - Cutting

PRODUCTION (GRINDER -

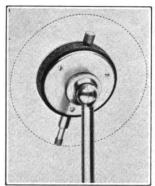
with two other uses!

No. 362-4 in the HERCULES line of fast cutting portable tools, this grinder is made in speeds of 4800 and 6000 R.P.M. and uses a 6" x 2" cup wheel for surfacing castings, flat metal surfaces, weld seams, grinding dies, etc. Easily fitted with felt pad and abrasive disc it will sand and polish or with a cup wire brush it will remove scale, point, etc. A well-balanced tool of many uses, ample power and long life, it will cut costs for you as it has for others.



A complete line of Grinders — Sanders — Polishers — Drills — Scredivers — Nut Runners; in Portable Pneumatic and High Frequency Electric Tools.

THE BUCKEYE PORTABLE TOOL CO. HERCOLS





The Geneva Universal Holder permits moving the indicator through a 180-deg. arc in a vertical plane or revolving the indicator 360 degrees.

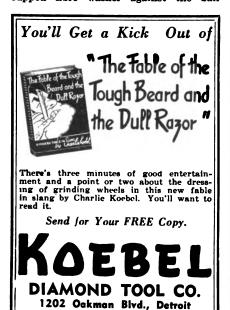
joint, thereby clamping the indicator securely in the position desired. The ball joint has a $\frac{1}{2}$ -28 thread to take round, square or other types of shanks. With the shank in position, the indicator point is free to move to The indicator angles. can turn 180 deg. on inner section the ball joint and 360 deg. on a complete circle when in any position on the 180 deg. arc, as shown in the illustration.

The ball joint construction makes possible an unbelievably wide range of indicator settings. The universal movement is controlled by the single knurled thumb nut, which permits the indicator point to be set instantly. Tightening the knurled thumb nut compresses a cupped fibre washer against the ball

Wrigraph Drafting Machine

A dratting machine of a new and larger type, with much greater accuracy, and very rugged construction is being sold through the Wrigraph Sales Division, 5207-16 Euclid Avenue, Cleveland, Ohio.

The new Model R-300 Wrigraph ma-







For ALL Wheel Bressing **Operations**

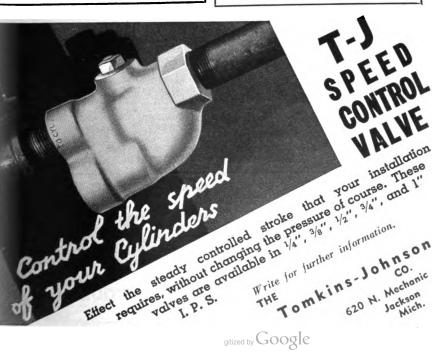
The new EVER-SHARP DIA MOND TOOL is made with a long, natural shaped diamond requires no resetting-is adapted to ALL types of wheel dressing operations -economical - accurate.

WHEEL TRUEING TOOL CO., INC. DETROIT, MICH. 13931 OAKLAND AVE.



EASILY CLEANED. The case stem of the Ames Shockless Gauge can be easily unscrewed, the lower half of the spindle withdrawn for cleaning and the assembly replaced without otherwise disturbing the gauge. For details of other exclusive features, send for the Ames Gauge catalogue.

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188

chine is a precision instrument that will easily make drawings up to 28x38 in. An attractive mounting clamp holds the machine onto any drawing board; the machine is self leveling. The permanently calibrated parallel mechanism guarantees the highest accuracy and complete dependability. It is assembled with eight special Precision ball bearings, made by Fafnir, which are prelubricated and sealed at the factory. Aluminum alloy castings are used, and all parts are given a dull, satin finish to prevent glare.

The indicating protractor is of a new type, with which one degree angles can

be obtained in one simple operation. The protractor may be clamped rigidly against rotation, and an automatic stop makes it possible to accurately return the protractor to the zero position. Scales are made of Duraluminum and are readily interchangeable. The graduated drawing edges on the scales are made of the finest transparent pyralin. A scale chuck plate adjustment provides for extremely perfect right-angle alignment.

The Wrigraph Drafting Machine is the only instrument of its kind which provides, through a very rugged clamping arrangement, a "no set zero" protractor head. All standard architectural and engineering graduations are obtainable.

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e This U.S. Multiple Drill Head drills four heads at once....does your drilling job 4 times as fast.

With other U. S. heads, as many as 50 holes can be drilled at one time. Let us show you how to save money on special jobs.

Send blue prints for estimates.

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Red-E Safety First Belt Stick

The belt stick illustrated herewith—product of The Ready Tool Company, Bridgeport, Conn.—was designed to make

possible the shifting of belts without danger. As shown, the belt stick is provided with three rollers, two of which are tapered. It is said that this belt stick cannot catch as the tendency is for the belt to slide onto the pulley as the shifter slides away.

The Red-E Safety First Belt Stick is made in two sizes; the Style S1, for belts 1 in. to 3 in. wide, and the Style S2, for belts 3 in. to 4 in. wide.



Red-E Safety First Belt Stick

Metzgar New-Type Sheave

A new type of sheave is now being made by the Metzgar Company, 112 Logan St., S.W., Grand Rapids, Mich., to specifications in all sizes, either for



HAMILTON ELEVATING TABLES

Save time and money in lifting and handling heavy dies, tools, etc., in your tool room or stamping shop. All steel construction—anti-friction bearings—furnished with hand or electric power. Special tables built for your requirements. Write for illustrated circular.

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Mark It Quickly with a NUMBERALL



Made with 1 to 10 wheels. Stamp in perfect alignment. Shank for Hand or Press Stamping. Platform for Stamping Name Plates and other small articles.



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• NEW ABRASIVE BAND GRINDER . . .

"Built Like a Machine Tool"

The Hormel-M Grinder is sturdily built with a supporting leg under the grinding table to eliminate vibration and tipping due to pressure on the beit. Ball bearing throughout. Equipped with ALEMITE LUBRICATION complete with grease gun.

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HORMEL-M GRINDER WALLS SALES GORP.

96 WARREN ST. NEW YORK, N. Y.

THE NEWEST DEVELOPMENT IN

METAL CUTTING MACHINES

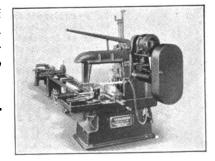
FULL AUTOMATIC-CAPACITY 10"x10" & 6"x6"

Stops when desired number of pieces have been cut. Length of cut is gauged by scale without end stop. Swivels on base for angular cutting.

Also built for manual operation.

RASMUSSEN MACHINE CO.

RACINE, WIS.



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life from micrometers by tipping your anvils and spindles with Carboloy.

Get the benefit of this diamond-like material at the point of wear on YOUR micrometers—get greater accuracy over longer periods of use than ever before possible. Send us your micrometers. We do the rest. Write for descriptive leaflet.

CARBOLOY COMPANY, INC. 2975 E. Jefferson Avenue, Detroit, Michigan

CARBOLOY TIPPED ANVILS



fastening to shaft, or fitted with oilles end-wood bearings, ball bearings of roller bearings.

This sheave is made of carefully selected hard maple, chemically treater all-wedge construction, with end-woo groove. Manufacturers guarantee it ur



Metagar New-Type Sheave

breakable. It is easy on belts, rope cable.

This sheave is of the same construction as the patented End-Wood True Wheel that has been manufactured this firm for many years. The sheries silent in operation and has the sailong-wearing qualities as that of Metzgar End-Wood Truck Wheel.

Ajax Model S-2 Flexible Coupli Ajax Flexible Coupling Company, English St., Westfield, N. Y., announ

English St., Westfield, N. Y., announ the addition of a Model S-2 Flexi Coupling having maximum bore of 1 inches to their complete list of coulings for direct connected maching for direct connected maching for direct connected maching rated at 12½ h.p. at 100 r.p.m. Ton rating is 680 ft. lbs. and maximum r.p. 7,500. Overall diameter is 6½ incl

Model 8-2 Couplings are of the sarubber-cushioned design as other T
"S" Ajax Flexible Couplings which stocked with bores from 114 in.

Rubber-Tired Wheels for Matthews Conveyors

The rubber-tired wheel shown in illustration represents recently de oped anti-friction products by

MARK IRON, STEEL, ETC.

with the Etchograp

BUY THE ORIGINAL ELECTRIC-ETCHER

in use MODE

2000



ELKONITE TIPPED PENCIL Circulars on request.

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Danly All-Steel Sets Danly Commercial Sets Danly Die Makers' Supplies

DANLY SERVICE

8 Danly Warehouses Provide 24-Hour Service for 85% of All Metal Fabricating Plants

DANLY MACHINE SPECIALTIES, INC.

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DANLY DIE MAKERS

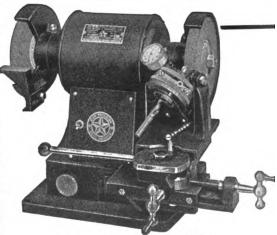
Grinds

81 SIZES OF Drills

No. 31 to 1/2"

This Star Precision Grinder puts drill grinding on a production basis. Its simplicity and accuracy saves as high as 50% on drill costs and insures uniform accuracy that guarantees perfect holes and increases production.

BLOOMFIELD AVE.

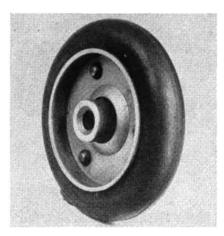


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STAR MACHINE & ENGINEERING CORP.

Division of Star Electric Motor Co.

BLOOMFIELD, NEW JERSEY



Rubber-Tired Wheel for Matthews Conveyors

Mathews Conveyor Company, Ellwood City, Penn. Two types are available, identical in design, and differing in construction only in that one is larger and heavier than the other. These wheels are practical for many different applica-



tions. When mounted in light frame they become an ideal conveying surface for shingles, steel sheets, glass, or an fragile object which must be protecte from jarring or scratching. The section are available straight or in any practice degree of curvature, with detachable of fixed couplings where portable or sta tionary conveyor sections are used.

While it might seem that these wheel due to the source of their developmen are intended for conveying only, such not the case. They could well be applied to casters for light dollies, sma hand trucks, and portable cabinets; the would be practical for many other use where a free-running, rubber-tired whe is required.

The wheels are of pressed steel cor struction, having hardened steel inne and outer ball races. The smaller whee which is 21/8 in. O. D., incorporates te 3/16-in. diameter hardened steel bal and has a rated capacity of 20 lbs. Th larger wheel which is 31/2 in. O. D., income porates eleven 5/16-in. hardened ste balls and has a rated capacity of 50 lb The latter wheel is of heavier construction tion throughout.

The rubber tire, which feature make the wheel adaptable for many uses, steamed into place. It contracts upo drying and fixes itself solidly on th As shown in the drawing, th inside of the tire fills the groove be tween the wheel flanges, holding the ti firmly in place.

company has identified the wheels as Types 70-RT and 84-RT, th latter being of the heavier construction

Allis-Chalmers Reversing Motor Starter

Allis-Chalmers Mfg. Company, Cond Works, Boston, Mass., announces a ne reversing motor starter, designated Type

STA-KOOL

The New Diamond Holder

Save diamond cost with this new improved fin type, air and water cooled diamond holder. Consists of a series of fins permitting greater radiation and consequently Tool protected by U. S. Patent No. 2047147. greater efficiency in the dissipation of ĥeat.



Send for complete details and prices.

J. K. SMIT & SONS, INC., 157 CHAMBERS ST., NEW YORK





1806 S. Kilbourne Ave., Chicago, III.

New 6" x 6" Peerless Improved High Duty Metal Sawing Machine With Hydraulically Operated Automatic Bar Feed

Automatically feeds the bar of stock forward to the gauge, automatically closes the vise, and automatically continues to repeat the complete cycle of cutting until the entire bar is cut to the length the gauge is set for, all without the attention of an operator.

The three speed sliding gear transmission—crankshaft—balance lever and trunnion blocks are fally ball bearing equipped. The fastest cutting time possible at a minimum blade cost en any kind of metal because of its modern design and rigid construction.



RACINE,

WISCONSIN

194

AP-7-R, furnished for 7½ h.p., 550 volts, or less. The starter consists of two Type AP-7 motor starter units, mechanically interlocked so that either unit cannot be closed if the other is closed. The starter units are equipped with Ruptors. The Ruptors consist of enclosing chambers which confine and depotentiate the arc formed by circuit interruption. They greatly increase the interrupting ability of the contacts and form individual isolating barriers between contacts of opposite polarity.

Other features are as follows: large silver double break contacts, long life,



The Demagnetizer

For Alternating Current

The J & H Demagnetizer requires no countershafts, belts, or other intricate electrical connections. All that is necessary is to plug it into the nearest lamp socket er receptacle.

It is of the new Unipole type — heavy duty — and can be supplied for either 110 or 220 volt alternating current. Size 12" long, 9" deep, 6" high. Weight 60 lbs.

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J. & H. ELECTRIC CO.

202 Richmond Street, Providence, R. L.

no contact dressing needed; solenoid operated, vertical make and break, silent operation; unit construction, pole unit



Allis-Chalmers Type AP-7-R Reversing Mot Starter

consisting of individual molded base mounted on a steel chassis, true con tact alignment; enclosed temperatur overload relays affording positive moto protection; undervoltage protection in herently provided.

Namco Super-Sensitive Line Voltage Switch

A super-sensitive switch claimed have unusually long life is announce by The National Acme Company, 12 East 131st Street, Cleveland, Ohio. It development and manufacture Chronologs and electrical recording counters, National Acme was forced develop switches which would stand under abnormal conditions.

The Namco Super-Sensitive Line Vol age Switch has many applications. may be used as limit switch, safet switch, or in connection with countr devices, circuit breakers, liquid lev

HOLE - PUNCHING NOTCHING DIES

Wales individual, self-contained dies for press and press brake. Nothing attached to press ram. Re-locate for new parts. Standard holes up to %", square notches up to \$x5—also Vee Notches—in flat sheets of 14 gauge or under.

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THE STRIPPIT CORP.

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The METCALF **Emery Wheel Dresser**

will do for you:

- a Dresses wheels up to 14" diameter.
- Cuts out bond or filing and loaves cutting particles standing out sharp and clear.
- e Brings up sharp corner on thin wheels. a Makes the surface true and even.
- e Can be used on all kinds of wheels.
- e Does not grab and tear the wheel.
- e Prevents chipping of the wheel.

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BIG RAPIDS . MICHIGAN . U.S.A.



Combination Demagnetizer and Electric Etching Pencil. Marks symbols in One of our models popular in tool rooms for 15 years.

Luma Electric Equipment Co. TOLEDO, OHIO DEPT. MS



For NERVOUS MACHINES

The Nut that can't shake loose

Vibration is licked when it meets "Unshake" . . . the ingenious self-locking ring, built right in the nut, holds it tight against the severest shaking and jarring, yet with an ordinary wrench it backs off without a murmur.

No separate washers, pins or parts. New in principle, it has successfully proven every claim in numerous industries where vibration exists. Write for information.

that keep man busy with

wrench

TANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA. BRANCHES BOSTON

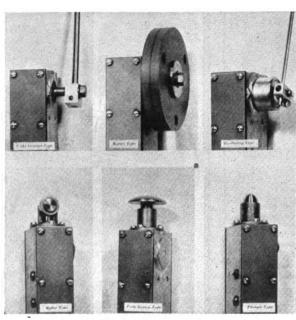
BRANCHES CHICAGO ST. LOUIS BAN FRANCISCO

Cutout Section Showing Ring in Place

DETROIT

BOX 556 INDIANAPOLIS

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Namco Super-Sensitive Line Voltage Switches

controls, gauge devices, relays, pressure controls and governors. The switch is made in five different types as illustrated. These are rotary, light contact, oscillating, plunger and push types.

The rotary switch is particularly adaptable where revolution contacts, linear measurement wheels, star wheels, etc., are to be used. Light contact switch is used for applications requiring an extremely light touch to make or break the circuit. The switch may be actuated by a pressure of only one

ounce with a nine inch lever.

The oscillating typ switch makes conta in one direction by not in the opposite d It has mar applications in the m tool field. T plunger or push ty switches require le than 1/16-in. movemen for contact and allo additional 3/16-i overtravel. The for overtravel. may be used as lim safety or cam-operat switches.

The main shaft co trolling the operation mechanism in the r tary and light conta switches is subtantia supported in oil ball bearings. The i ternal operating leve all models 8 equipped with an 8 justable steel sprin correct pre sure on the conte button. Actual ele trical contacts are ma

in the fully-enclosed, dust-proof, mouled, removable Micro Switch. The geeral design is such as required for rap contacts and continuous operation. Prysions have been made to wire for no mally open or normally closed contacts.

Standard mounting of all the switches is made with two ½-20 screen entering the two tapped holes provid in the bottom of the housing. Oth mountings are easily adaptable to me requirements, by applying special botto plates.





Standardized JIG BUSHINGS Acme Standard over 6700 Items A.S.A. Standard over 4200 items



Acme Drill Jig Bushings are made by the most exacting, scientific methods -insuring long wear, ac-curate fit, and absolute satisfaction. A standard-ized product, carried in stock for prompt delivery in over 10,900 standard items—all completely fin-ished and ready for use. Special sizes made to order.

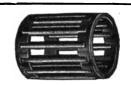
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ACME INDUSTRIAL COMPANY

212 N. Laffin St., Chicago, Ill.







JOURNAL ROLLER BEARINGS Special Bearings Made to Order.

Any quantity.
"One Bearing or One Thousand Your present bearings duplicated. Send sketch or worn sample, regardless of condition, for quotation.

Catalog Upon Request THE GWILLIAM CO. 358 Furman St., Brooklyn, N. Y.

"GUSHER" Coolant Pumps The Ruthman Machinery Company offers a COMPLETE line of Low power consumption-elimination of packing glands-auto-

A Pump for Every Type of Machine Tool

modern coolant pumps-designed to meet every modern cutting seed.

matic priming feature—use of centrifugal force—these features and many more make RUTHMAN Gusher Pumps economical necessities for your shop.

Write for free data sheets.

THE DIRECTION AND MACHINERY CO. 538 East Front St.

The rapid snap action of the contacts, the generous use of silver in both contacts to dissipate heat and the size of the switch gap all make it possible for the Micro Switch to break large currents.

The Micro Switch used as the contactor in Namco devices is the product of the Micro Switch Corporation, and

carries U. S. Underwriters' Laboratories label and Canadian Hydro-Electric Power Commission approval No. 4442 on the following ratings:

10 amperes at 125 volts A.C. 5 " " 250 " A.C.

5 " " 250 " A.C. 3 " " 460 " A.C. 2 " " 600 " A.C.

Namco switches are designed for alternating current applications. For special direct current applications, suitable condensers must be provided.

Special care has been taken to insure long life in Namco switches. The Micro Switch spring is of beryllium copper specially heat treated to give greatest fiexure life. Movement of the operating plunger against the spring is limited by a rigid stop to 11/1000 of an inch.

Ajax Electrothermic Equipment for Induction Heating

Two new applications of induction heating have been installed by Ajax Electrothermic Corporation, Trenton, N. J., consisting of (a) induction heating of tube ends prior to a series of forging operations and (b) heating an end section of a large steel tube prior to a swaging operation.

The illustration Fig. 1 shows the individual heater control panel and the coil with two steel tubes inserted. High frequency power at 2000 cycles is applied

to the coil and in less than one minute, 6-in. end sections of the two steel pipes are heated to 2200 deg. F. after which they are forged.

Fig. 2 shows a special focus inductor coil and a narrow band at the end of a tube heated to 2200 deg. F. This is a subsequent operation to that described in the preceding paragraph. The draw

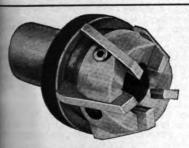


Fig. 1—Heater Control Panel and Induction Coil wit two work-pieces inserted.

ing Fig. 3 shows a cross section of th focus one-turn coil, the tube end an indicates the sharply defined heatin zone.

In connection with this device, incidentally, this coil is the same funds mental type focus inductor coil which is used in the so-called TOCCO proces for hardening crankshaft bearings. The process was developed at Trenton and the refinements were incorporated by The Ohio Crankshaft Company—the so





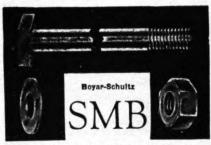
GENESEE ADJUSTABLE HOLLOW MILLS

Are Cutting Costs Everywhere SEVEN DIFFERENT STYLES

Have Genesee cut your costs. We design and manufacture hundreds of special and multiple operation production tools. Send samples or blueprints now.

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GENESEE MFG. CO., Inc.



SPECIAL MACHINE BOLTS

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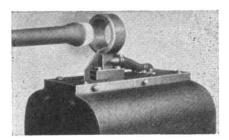


Fig. 2—Special Focus Inductor Coll. The end of the work-piece has been heated to 2200 deg. F.

licensee for this process for crankshafts and camshafts. The difference in the two applications is that for surface hardening, a large amount of power is concentrated for a short time so that the heating is all confined to the surface of the crankshaft and it is then rapidly quenched to produce a very hard surface with a tough core. In the tube end heating applications, Figs. 2 and 3, the power is not kept at such a high value—the time is extended to nearly a minute and the walls of the end of the tube are uniform in temperature at 2200 deg. F.



Fig. 4 shows this uniform heating of an end of a bar or billet—this time using a straight coil energized with high frequency current. As a matter on note it is possible to heat uniformly throughout the section a 3-in. diamete billet to 2200 deg. F. in two minutes A 7-in. square billet tested came uniformly throughout the section to 220 deg. F. in 15 minutes. Temperature were checked at the surface and center with thermocouples. To heat steel from room temperature to a forging temperature requires about 400 kwh. per too overall.

The photograph Fig. 5 shows the set

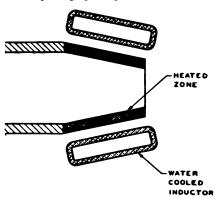


Fig. 3—Drawing showing cross-section of one turn coil.

up described in the preceding paragraph. The same arrangement applies to the second installation mentioned. Actually the steel piece shown in the photograph is a steel tube closed on the unheated end, running about 5-in. diameter with $\frac{1}{2}$ -in. wall. Uniform temperatures in the wall section require about one and one-half minutes. For this job the tube

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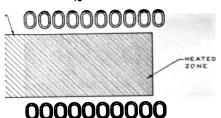
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is designed to provide a graded temperature. The open end (inside the coil) is heated to about 2000 deg. F. and gradually tapers back to 1800 deg. F. at the end of the 6½-in. heated section. This



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Fig. 4—Illustrating uniform heating of end of billet.

is ideal for the forging operation and is easily accomplished by altering the coil turns per inch or the location of the load in the coil. If, however, the user wants an end section at uniform temperature throughout with a sharply

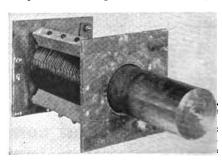


Fig. 5—Straight coil energized with high frequency current.

defined heated zone, this can be easily accomplished. The method lends itself nicely to automatic control, which is being planned for both jobs.

Improvement in Fafnir Rubber Pillow Blocks

The ballbearing rubber pillow block announced by Fafnir Bearing Company. New Britain, Conn., a few months ago has been redesigned to include a wide inner ring ball bearing with an exclusive self-locking collar which is said to





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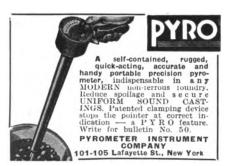
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make for easy installation. The shaft is slipped through the bearing unit, the self-locking collar is engaged and turned, and the setscrew is tightened. The bearing is then firmly secured to the shaft. Removal is equally easy.

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out and grease in. The bearings are packed at the time of assembly with sufficient grease to last for years. circular completely describing Fafni Rubber Pillow Blocks may be had by writing The Fafnir Bearing Companies above.

Industrial Rubber Mounting Manual

As a result of popular demand the United States Rubber Company, New York, has issued a practical manua which will serve as a ready reference for engineers, plant operators and executives on the application of rubber mountings to modern industrial use Rubber mountings, properly designed and fabricated and installed in accordance with sound engineering practice have proven of outstanding usefulness for absorbing vibration, preventing "telegraphing" of noise and cushioning impact.

The issuance of this manual is to assist engineers in properly adapting the various "U.S." designs to their specific needs. It gives complete engineering data indicating the various characteristics of rubber, graphs showing its deflection curves, and its safety load limits.

Descriptive illustrations show specificuses to which these mountings have been put. These include the recently installed rubber mounted floor in the new Physics Laboratory at the Massa chusetts Institute of Technology, which functions so successfully that not ever the reversing of the 8000 pound plane produces shock on the rest of the building. Copy free upon request.

MAGNETIC HAND BOOK is the title of a new loose-leaf manual issued by the Stearns Magnetic Mfg. Co., Milwaukee, Wis., for distribution to its sales organization. It comprises 170 pages



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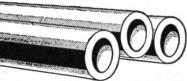
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9x12-inch format, with rich fabricold cover. This new book was compiled in answer to the demand for a standardized catalog containing technical data, illustrations and description of the various phases of magnetic engineering and is a comprehensive survey of the subject.

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Also described are the numerous types of friction devices employed in power transmission. The Stearns Company has pioneered more equipment of this kind than any other manufacturer in the business, according to its claim. Magnetic clutches, brakes and clutch-brake units; duplex clutches and other combinations are shown in text, drawings and illustrations.

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HOW TO BELT YOUR DRIVES FOR MORE PROFIT. Announcement is made of the publication of a new leather beltmanual containing transmission data, engineering tables, and simple belt formulae, by E. F. Houghton & Co., 240 W. Somerset St., Philadelphia.

This booklet, entitled "How To Belt Your Drives For More Profit", is replete with helpful facts for the belt man, including such material as selection and care of leather belts, how to make them endless on pulleys, types of lacings, cementing instructions, belt preserva-tives and up-to-date engineering tables.

It also contains a full description of the various types of belting made by E. F. Houghton & Co., including the new VIM TREE Leather Belting. Copy

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"STRENGTH PLUS" is the title of a new booklet describing the solution to scores of actual metal problems as encountered by the engineer. The book is now being distributed by The International Nickel Company, 67 Wall St., New York, N. Y. Containing 48 pages, illustrated throughout, this booklet has been trated throughout, this booklet has been prepared primarily as a guide book to Monel and other non-ferrous nickel alloys in the fields of engineering appli-

cations. It also covers the corrosion resistance and other properties of these metals.

The booklet includes 20 sub-divisions, each devoted to specific problems in fields from hydroelectric and steam power plants to highway maintenance, refrigeration and automobiles.

Besides going into details of standard Monel the booklet describes some of the never forms of this alloy, including "K" Monel, "S" Monel and the like. The non-magnetic forms of the metal are also covered in a special section devoted to airplanes and the like. Inconel, the nickel-chromium alloy, is another subject covered.

Special items included are those dealing with meters and other regulating equipment, sewage disposal, pump main-tenance and other items of general in-terest. The booklet is available without charge to engineers and plant executives.

How To Bun a Lathe-The 33rd edition of the well-known machinists' manual, "How To Run a Lathe," has recently been announced by its publisher, The South Bend Lathe Works South Bend, Indiana. The new edition

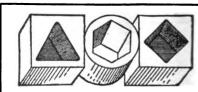


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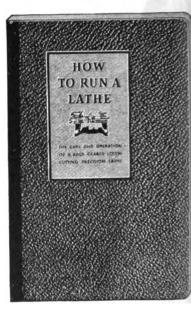
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"LESSONS IN ARC WELDING", published by The Lincoln Electric Company, Dept. E-320, Cleveland, Ohio, to provide it welding operators and other interested individuals a thorough working knowledge of the practical application and use of arc welding, has been reissed in considerably enlarged form. The volume, profusely illustrated by sketches, now contains 44 lessons and approximately 130 pages, compared with 28 lessons and some 60 pages in the original edition.

The widespread interest in the lessons is indicated by the fact that approximately 10,000 copies have been purchased

dince original publietion three years go. The lessons are based on the course n arc welding which as been conducted by the company in ts plant Welding school for nearly 20 ears and are esult of experience n teaching thouands of men to become practical arc relding operators.

"Lessons in Arc Welding", beginning with general fundasuggestions, nental akes the student by asy stages through ll the important hases of practical rc welding and afords him thorough nstruction on the ubject. The lessons over: the arc weldng machine, its opration and control; he shielded arc and ts uses; striking the arc and running orizontal unning a bead not ess than 12 inches ong; weaving the lectrode; effect of rc length, current nd speed on bead; ffect of polarity on ead: various types f electrodes; pad-ing and building p plates; building p shafts, butt elds; lap welds;

vertical

welds;

welds; horizontal welds; overhead welding; expansion and contraction; penetration and cutting; welding of mild steel, light gauge steel, high tensile steels, cast iron, stainless steels, hard facing various metals to resist shock, abrasion and corrosion; welding aluminum, bronze, brass, copper and 4-6 chrome steels. Welding with bare electrode is also covered to give the student complete training in all phases of welding.

"Lessons in Arc Welding" is mimeographed on pages 8x11 in. with simulated leather binding, flexible and durable. Copies are mailed, postpaid, to



any address in the United States for 50 cents each, 75 cents elsewhere.

Lukens Nickel-Clad Steel. This 24-page book, issued by Lukens Steel Company, Coatesville, Pa., comprises an exposition of the superior results that can be obtained in certain instances through the use of corrosion-resistant steel. Lukens Nickel-Clad Steel is a bimetal consisting of a light layer of pure, solid nickel permanently bonded to a heavier layer of steel. The nickel surface is homogeneous and dense in structure, and possesses the same chemical and physical properties as solid hot rolled or hot forged nickel in other forms. The steel layer is normally low carbon fiange quality steel, although certain other classes can be furnished if desired. Modulus of elasticity of the composite metal is 30,000,000.

Lukens Nickel-Clad Steel is generally applicable in all heavy equipment where pure, solid nickel itself would be advantageous. It is immune, in the same measure as pure, solid nickel, to attack by many corrosive agents, prevents iron or copper contamination and discoloration of many products, and is readily cleaned. It is furnished with a matte finish, nearly white in color, but not

having the lustre of cold rolled and full-finished steel.

The book is profusely illustrated with photographs of different kinds of equipment made from Lukens Nickel-Clac Steel, the illustrations being accompanied with descriptive text. Specifications of thicknesses, widths and length are included. Copy free upon request.

Manual of Factory Lighting Practice Practical solutions of 30 common light ing problems in industry are said to be explained in this 36-page book which is now being issued by Benjamin Electric Mfg. Company, Des Plaines, Ill The book is intended to provide the plant owner or operating executive with complete treatise covering the commonly encountered problems of factory lighting and their correct solution. It presents authoritative engineering information on practical, easy-to-apply methods of fitting the lighting to the seeing requirements of each individual operation in the plant. The text discusses 30 common lighting problems found in the various operations and locations in the average plant and gives definite recommendations, installation diagrams, and equipment specifications





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The book is written in plain, non-technical language and is profusely illustrated with drawings showing the re-lation of the lighting equipment to var-ious seeing problems encountered at the work bench, on the erecting floor or at various types of machines. A page is devoted to each problem with photographs of the different kinds of lighting equipment recommended for the different problems. The answers are given to scores of problems involved in inspection and production operations found in practically any industrial plant. In other words, the book is written for the executive who wants detailed instructions on how to "tailor" his lighting to the seeing needs of his individual oper-

Copies of the book free to plant executives.

Grinding Wheel Specifications for Grinding Machines. For the purpose of simplification and in the effort to reduce the great variety of grinding wheels used in the past, as well as to furnish a guide for the designer of future grinding machines and attachments, wheels of certain types and dimensions have been adopted as standard by the Grinding Wheel Manufacturers Association of the United States and Canada in collaboration with the United States Department of Commerce, Simplifified Practice Division. The Norton Company, Worcester, Mass., is now issuing a book of grinding wheel specifications for grinding machines which includes complete specifications for all of the standard and special shapes of grinding wheels made by the firms referred to. Specifications are given for wheels required for each type of machine made by each one of these firms,

giving dimensions. telegraphic code words and list prices. To enable the user to visualize at once the wide range of types of grinding wheels, the book includes cross-section drawings of the nine standard types which are representative of practically all grinding The nine types are numbered wheels. and each dimension is designated by letter. This classification of grinding wheels greatly simplifies the stocking of wheels wherever a quantity is kept on hand and enables the user to order a grinding wheel by giving the type number and dimensions necessary to con-

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struct such a wheel as designated by the cross-section of that type. Copy of this book free upon fequest.

An Analysis of An Installation of Dust Suppression Equipment. By Hugh E. Keeler of the Department of Engineering Research, University of Michigan. This report outlines the testing equipment and apparatus, method of conducting the tests, and results of tests that were made by the University of Michigan Department of Engineering Research to determine the dust collecting efficiency of a Schneible "Multi-Wash" Dust Collec-



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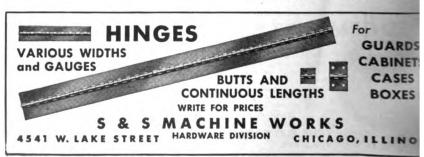
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tor installed in Building No. 70 of the Buick Motor Company, Flint, Mid This building is one of the important buildings in the large foundry ground the No. 6 molding equipment units the newest and of the most advance design. The dust collector is nominal rated at 30,000 cu. ft. per minute at was designed, manufactured and is stalled by the Claude B. Schneible Company, 3951 Lawrence Ave., Chicago,

The dust collector is a heavy du high efficiency type for handling that is heavily laden with dust w other impurities. In the course of t test a determination was made of t amount of dust in the air at the brest ing line (nose level) at the shaked of the No. 6 molding equipment u and in the air at a point nine feet hind the operators at the shake-out a midway between them. The tabula results of the tests show the avertotal pressure; inches H.O. at the vi ous points indicated, the average st pressure; inches H.O. average velor pressure, inches H.O. the dry bulb wet bulb barometer readings, rela humidity, millions of dust particles cubic foot of air, total solids per ct foot of air in grams and total solids pounds, total silica (SiO₂) per c foot of air in grams and in pour silica (SiO₂) per cent, all other sol per cent, fan speed r.p.m. and m speed r.p.m. The report includes a description of the conditions which the tests were made and sh a number of photographs of the inte of the foundry and the dust collecte installed. Copy will be sent to any chanical engineer who will address Claude B. Schneible Company.

Odin Universal Clamping Device number of different kinds and type jobs that can be handled efficient the use of the Odin Universal Clam Device are described and illustrate a four-page folder which has been is



by Odin Universal Corporation, 110 S. Dearborn St., Chicago, Ill. Copy free upon request.

Vibration Study and Other Industrial applications of Neobeam Oscilloscope. This eight-page folder, 8½x11 in. in size, iescribes the details of construction and dvantages that are available through the use of the Neobeam Oscilloscope, product of Sundt Engineering Company, 240 Lincoln Ave., Chicago, Illinois.

The Neobeam Oscilloscope is a highly ensitive, completely self-contained portthe unit operating on the modulated son beam principle. Together with its suriliary equipment, this instrument is used in studying and analyzing vibra-ion, noise levels, isochrometer tuning, nagnetic balancing, and for checking

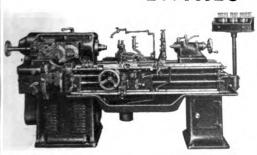
ommutator roughness.

The built-in high gain amplifier mod-lates a neon column constantly exited by radio frequency. The fluctuan the scanning mirror, thus showing he exact wave pattern of potential or ound under observation. The maxinum sensitivity is 1/8 in. deflection at ne millivolt input. The calibrated weep control synchronizes the scanning mirror to the frequency observed. This calibration, together with the calibrated screen, permits frequency determinations to be made directly by applying a formula given later. Frequency determination is a necessary feature in vibration study.

The units required to make the various tests listed above include the Neobeam Oscilloscope, crystal microphone, vibration pickup (contact type), permanent magnet dynamic speaker, vibration and vibration (crystal type), pickup (wager crystal type). This folder describes and illustrates each one of these instruments in detail and is intended to serve as a general guide to the application. Directions are given for detecting noise and vibration, for testing electric motors, making ball bearing tests, making vibration studies of gear trains, making studies of the bouncing action in cam actions, detecting cracks and fractures in longitudinal rods and shafts, and so on. The instruments are also used for determining the comparative smoothness of materials such as paper, for tuning by the isochrometer method or matching two sources of audio frequency, and for balancing magnetic fields.

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 New features include Quick-Change Gear Box —a separate, enclosed unit, tongued, grooved and bolted to the front of the bed. All shafts in gear box and on quadrant operating on anti-friction bearings. 48 complete thread feed changes without the use of extra gears.

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216

Grinding Cemented Carbide Tools. To obtain the greatest possible savings with cemented carbide tipped tools, proper regrinding before they become dull to the point of failure is essential. continued use of a dull tool (of any type) results in increased pressure on the tip and greater power consumption, as well as danger of tool breakage.

Because the cemented carbides entirely different from high speed steel and Stellite, both in composition and physical properties, they require different grinding wheels and a different technic to grind them successfully. This handbook, which is now being distributed by Norton Company, Worcester, Mass., has been prepared with the object of assisting toolroom operators in the selection of the proper grinding wheels and in the employment of the correct methods for sharpening their cemented carbide tools so that the most efficient and most economical service may be obtained. Copy free to any mechanical executive or engineer upon request.

Fairbanks-Morse Bulletin 5814F. This bulletin describes that company's Ball Bearing Centrifugal Pumps, which have been especially designed to fully satisfy the exacting requirements of, and have been approved by, the Nationa Board of Fire Underwriters and the As sociated Factory Mutual Fire Insurance Companies.

Correct design, high-grade material and precision manufacturing method have made of F-M Centrifugal Fir Pumps highly efficient units, instantl ready to operate at full capacity and pressure. They provide a steady, non pulsating flow with uniform pressure and at shut-off or maximum pressure can operate against a closed valve with out damage to pump mechanism or con necting pipe.

The pumps are offered with electri motor, gasoline engine, steam turbin dual motor and engine, and dual moto and turbine drives. Copy of the bulk tin free by addressing Fairbanks, Mors & Co., 910 S. Wabash Ave., Chicago

Illinois.

Tornado Portable Industrial Vacuui Vacuum cleaning, generall recognized as the most efficient metho of cleaning, is now available for indu trial use, a portable industrial vacuu cleaner having been developed which combines the efficiency of this type cleaning with the rigidity and sturd



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Wheels for all trucks. Casters for all purposes.
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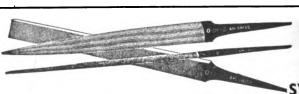
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ness of design and construction necessary for industrial purposes. The Tornado Portable Industrial Vacuum Cleaner comprises a specially designed 1 h.p. G-E universal motor and single stage fan developing 46.25 ft. of waterlift (static pressure) and handling 175 cu. ft. of air per minute. The motor is mounted on Norma ball bearings, thus obviating necessity of oiling. It operates from electric socket at a cost of less than three cents per hour. The machine weighs only 40 lbs. and can easily be moved between aisles in the machine shop or stock room. A copy of this folder free upon application to Breuer Electric Mfg. Co., 843 Blackhawk St., Chicago, Ill.

How To Weld Twenty-Nine Metals. A comprehensive book, entitled "How to Weld 29 Metals," covering the procedure, conditions and materials for welding modern alloys has recently been published by the Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa. Specific data for welding all types of joints with varying thicknesses of metal, such as electrode diameter, welding current, speeds, deposition, etc., are included.

Prepared by Chas. H. Jennings, whose

experience and exhaustive investigation into the joining of metals have eminently qualified him as an authority on the subject, this book should be of great value to welding operators in simplifying and improving the welding of present day metals and alloys. Copies of the book are available at 50 cents each from any Westinghouse Welding distributor or direct to department 5-N. Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pennsylvania.

Newark Testing Sieve Shaker and Testing Sieves. The Newark Wire Cloth Co., Newark, N. J., have recently issued a small folder which illustrates and describes their new "End-Shak" Testing Sieve Shaker. The folder tells how the End-Shak machine not only imitates hand testing but does a better, quicker, and easier job of it.

In addition, the folder contains considerable valuable information on Newark USS-ASTM Testing Sieves—the importance of accuracy—features of the U.S. Standard series—how sieves are graduated—the finest wire cloth in the world (Newark's 400 square mesh)—and a table of sizes, code words and prices Copy free upon request.

IT'S PRECISION BUILT .the C-0 21" Sliding Head Drill

Here's a typically accurate, flexible, yet larger C-O Drilling Unit for high production drilling of large holes. Self-feed ahd back gear attachments provide a wide range of speeds and feeds.

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Maxwell E-Z Set Boring Tool. This four-page folder, issued by F. A. Maxwell Company, Bedford, Ohio, illustrates and describes in detail the Maxwell E-Z Set Boring Tool, Mastur Precision Boring Head, and Maxwell Utility Grinder. Of particular interest is the description of the E-Z Set Boring Tool which is adaptable to any machine or job where it is necessary to adjust the tool for size. Through the medium of an eccentric bushing in the tool block, the block can be adjusted in the worm to compensate for wear. Adjustment is obtained by means of a worm which engages the hobbed end of the tool block. The tool is intended principally for boring, but can also be used for turning a radius.

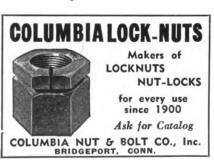
The Maxwell Utility Grinder is designed both for external and internal grinding. Copy of the folder free upon request.

Oilless and Self-Lubricating Bearings and Special Shapes. This catalog now being issued by Neveroil Bearing Company, Wakefield, Mass., describes the line of oil-impregnated wood and graphited metal bearings made by this firm. These bearings are intended for use in

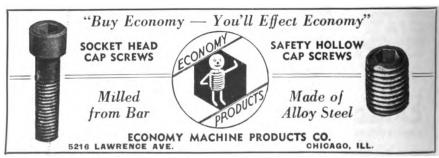
places where ordinary methods of lubrication are difficult or where ordinary oil lubrication is practically impossible because of the processing methods in use. In many industries a single drop of excess oil may spoil a batch of valuable material and in others the presence of excess oil is always a potential fire hazard. Again, extreme heat or the presence of water or other liquids may make oiling impractical.

The wood impregnated bearings are made of carefully selected hard wood Lubricants are forced into the wood cells under extreme pressure by a process originated by this company. The graphited metal bearings are made from a series of metal alloys. Throughout the mass of each alloy is disseminated a special grade of fine flake graphite the method of impregnating being such that all possibility of the graphite either being washed out or shaken out by vibration is eliminated. Such bearings can be used in water, hot cleaning solutions, and under certain acid conditions.

These bearings can be supplied in any size or shape required, but the prospective user should describe the proposed application when writing to the manufacturer of the Neveroll bearings. Copy of the catalog free upon request.







Extra Smooth Leafing Aluminum Finish; "Blue Knight Leafiex No. 5900". A product summary giving the properties of this cellulose type, air-drying, fiexible lacquer enamel for low cost finishing. Samples on brass are available for testing by scratching, bending, etc. Address Roxalin Flexible Lacquer Co., Inc., Eizabeth, N. J.

Century Direct Current Motors. The line of direct current motors in integral sizes from 1 to 300 h.p. built by Century Electric Company, 1806 Pine St., St. Louis, Mo., is described and illustrated in an eight-page folder now being issued by this company. The motors are adaptable for constant, adjustable and arying speed applications, and for continuous or intermittent service. Copy free upon request.

Whitney Roller Chain Sprockets, Price List V-125. The Whitney Chain & Mfg. Co., Hartford, Conn., has announced the publication of their Price List V-125. which is intended primarily as a price list and reference book on Whitney

stock and made-to-order sprockets, although condensed information on chain selection is also included. Specifications for the various types of sprockets made by this firm are included in this 96page illustrated booklet. Copy free to any mechanical executive upon request.

Johnson Bearing Wall Card. A new Wall Card covering the complete line of Johnson Cast Bronze Graphited Bearings —Bushings has just been released.

This reference chart gives complete information on over 200 sizes of cast bronze graphited bearings with valuable information covering their applications, tolerances and alloy. Also, a valuable graphic illustration explains the Johnson method of combining graphite and bearing bronze. For special applications at elevated temperatures the benefits of using Johnson Plug Type Graphited Bearings are fully covered.

The Wall Card may be hung on the wall and provides quick reference for design engineers and others who frequently must refer to this information. A copy is available by writing to this publication or direct to the Johnson Bronze Company, New Castle, Pa.

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Hevi Duty Type HD-92 Muffle Furnace, a new development of the Hevi Duty Electric Company, 4212 W. Highland Blvd., Milwaukee, Wis., is described and illustrated in Bulletin HD-537, now being issued by that firm. The bulletin explains the construction, manner of locating the four heating coils in the heating chamber, the temperature range, control and operation, and voltages. Specifications are given for the Types HD-92 and HD-96, which are the two sizes in which this furnace is made. Copy of the bulletin free upon request.

Wright Low Elevating Platform Truck Catalog No. 4. This 16-page catalog de-



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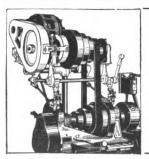
6538 Carnegie Ave., Cleveland

scribes and illustrates the features the Wright industrial truck, manufatured by Wright-Hibbard Industrial Electric Truck Co., Inc., Pleasant Phelps, N. Y. Beginning with a disciplinary of the mechanical features, whis illustrated with pictures of the tails of the mechanism, the cata shows a number of typical uses of a truck, describes the outstanding advances, and closes with a table of specifications. Copy free upon request.

"The Story of Plastic Molding" is a title of a 40-page booklet now being d tributed by Chicago Molded Productorp., 2145 Walnut St., Chicago, I The booklet includes an article on mol and how they are used, an explanation of the factors which determine price, description of the various molding a terials and their properties, hints design, and a comprehensive listing parts available from stock molds. I text is well illustrated with photographic and drawings. Copy free to any ple executive who will address his requon his company letterhead.

Ward Leonard Alternator Voltage Bulators. Bulletin 5601, published Ward Leonard Electric Co., Mt. Vern N. Y., describes and illustrates the Eltronic Regulator, which can be with any known method of excitati It explains in complete detail, the opation of this comparatively new methof automatic, voltage regulation.

Bulletin 5602 describes and illustra a similar Regulator designed for o one scheme of excitation, that is, regulator for each excitor. General can be paralleled. Bulletin 5601 a 5602 Regulators are both quick respo types, corrective action starting wit ½ and one cycle, respectively, of change in alternator voltage.



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REMCO MOTOR DRIVES

"Powerduct Cable" is the title of a ur-page folder, now being distributed r Anaconda Wire & Cable Company, Broadway, New York, N. Y., in which e use of Powerduct Cable in one of e large automobile plants is described. Itual installation photographs and a oss-section drawing showing the conruction of the cable are included. The page 1999 free upon request.

Baldwin-Duckworth Standard Hub workets Bulletin 60. This 24-page woklet, now being issued by Baldwinuckworth Chain Corporation, Springid. Mass., lists the dimensions and ices of the standard hub sprockets for agle, double and triple roller chain ade by this firm. The booklet is illusated with photographs and drawings the various types of sprockets and ains, and tables of specifications and ices are included. Copy free upon quest.

Rivett No. 112 Internal Grinder alletin No. 112A. The Rivett No. 112 ecision Internal Grinder, which has en designed for medium and large toolroom work—straight, bevel, two angle, or straight and bevel at one setting—is described in a four-page illustrated folder now being issued by Rivett Lathe & Grinder, Inc., Brighton, Boston, Mass. A list of the special features of the grinder and a table of specifications are included. Copy free upon request.

Michigan Leather Packing Company Bulletin No. 701: The Michigan Leather Packing Company, 752 Fourteenth Avenue, Detroit, Mich., has issued an illustrated bulletin—the No. 701—describing the mechanical leather packings and oil seals made by this company. The bulletin is of particular interest because it includes illustrations and a description of an unusual and exacting test which is being made on one of the various types and designs of mechanical leather packings. In the course of the test the packing is subjected to a temperature of 225 degrees F. for 24 hours and then plunged into a temperature of 2 degrees below freezing for another 24 hours, and is then expected to hold a 100-lb, weight for another 24 hours without giving more than 1/32 inch. Copies free upon request.



utton Catalog No. 12 gives complete details of DIAMOND-GRIP Collets and Sutton sed Fingers for all makes of automatic and hand screw machines. Send for a copy.

SUTTON TOOL CO. 2838 W. Grand Blvd., Detroit, Mich.



The American Rolling Mill Company, Middletown, Ohio, has just issued a 26-page booklet on "Armoo Stainless Steels-Chromium Nickel Grades". Uses of Armco stainless steels in many products are illustrated.

The booklet contains detailed information on heat treatment, drawing, punching and shearing, spinning, riveting, welding, electric and gas welding, soldering, brazing, and pickling. There are charts, too, showing the chemical and physical properties of Armco stain-less steels, in addition to corrosion, resistance data. Copy free upon request.

The Repair of Damaged Machinery. This profusely Cast Iron illustrated booklet which has just been released by The Linde Air Products Company, 30 East 42nd Street, New York, is a consolidation and orderly arrangement of the known facts regarding the repair of damaged cast iron machinery by the oxy-acetylene process. The booklet discusses the applications for which the respective processes of bronze-welding and fusion welding are best suited. How the composition, the physical properties, and the intended use of the casting respectively influence heat control methods and the choice of welding procedure are considered.

Neither shape nor size, according to the booklet, places any limitation on the use of the oxy-acetylene process for the repair of gray iron, malleable iron, or alloy castings. Bronze-welding, because it is done at a lower temperature, is said as a rule to be more economical and efficient than the fusion welding of cast iron. Special cases where this rule does not apply and where fusion welding is preferred are mentioned.

Those whose activities involve the use or repair of cast iron machinery will find it well worth their while to obtain a copy of this eight page illustrated booklet free upon request.

STURDIMATIC TOOL COMPANY

"The Welding of Enduro Stain Steel" is a new 20-page booklet j published by Republic Steel Corpo tion, Cleveland, Ohio. Profusely ill trated the booklet describes in detail proper methods for welding stain steel by electric arc, gas, seam, spot, p jection and atomic hydrogen metho Also included is information on braz and silver soldering. An interest feature is a table showing in conden form the physical, electrical and 1 chanical properties of thirteen of more important types of Enduro St less Steel, contrasted with similar pr erties of a carbon steel, S.A.E. 102 Copies of the booklet, form Adv

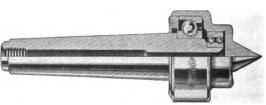
are available upon request.

"Greater Lighting Efficiency", an 11 trated booklet published by the Gen Electric Vapor Lamp Company, Adams St., Hoboken, N. J., gives t and figures about the newly impr horizontal Cooper Hewitt lamps. In new booklet may be found a descrip of both the 33-inch and the 50lamps, as redesigned for better indus lighting, particularly for precision 1 of all kinds. The booklet sets forth provements of the lamps over for models, such as increased light ou per watt, instantaneous starting, 1 zontal suspension, greater operating bility, the highly efficient reflector the new simplified design.

In a section of Engineering Data, uable information is given for com ing the proper spacing of Cooper H lamps to obtain any given illumin level. In addition, photometric re for both the 275 and 350 watt h are given, as well as the essential di sions and layout of lamp suspension

"Greater Lighting Efficiency" ma obtained by writing the General Ele Vapor Lamp Company, 893 Adams Hoboken, N. J. Ask for Bulletin No.





It turns with the w Eliminates friction of d center.

Lowest possible overh prevents vibration chatter.

Write for Catalog a Free Trial Offer 5222 THIRD ST., DETROIT, MICHI "Armeo H.T. 50" is the title of a folder published by The American Rolling Mill Company, Middletown, Ohio, in which the properties of the company's high tensile steel are described. A chart shows the comparison of physical properties between Armco H.T. 50 and a mild steel. Copy free upon request.

Bulletin No. 8-C-37 of Lewis Automatic Wire Straightening and Cutting Machines, now being issued by The Lewis Machine Company, Cleveland, Ohio, contains a general description of the design and construction of the Nos. 3-C, 4-C, 6-C, 8-C, 9-C, 10-C and 11-C machines built by this firm. Photographs are included to illustrate the points made in the text. A table of specifications is also included. Copy free upon request.

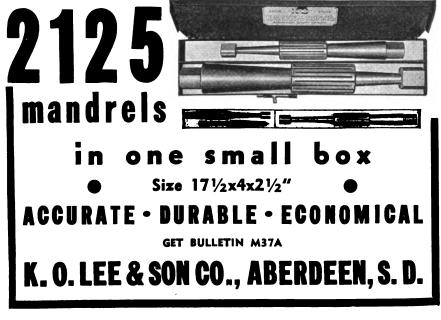
BEAVER PIPE TOOLS. The complete line of pipe machine and tools made by Beaver Pipe Tools, Inc., 770 Dana Ave., Warren, Ohio, is described and illustrated in a 40-page catalog now being issued by this firm. The catalog features the various sizes and types of pipe threading

and cutting off tools, Beaver electric power drive designed to convert hand pipe tools into power pipe tools, open and enclosed ratchets, threading tools with either American Briggs or British Whitworth standard threads, reamers, wheel cutters, sawing vises, and other tools made by this firm. Copy free upon request.

Shepard Niles Anti-Friction Bearing Hoists Bulletin 126. This bulletin, now being issued by Shepard Niles Crane & Hoist Corporation, Schuler Ave., Montour Falls, N. Y., illustrates and briefly describes the design and construction principles of Shepard Niles electric hoists. More particularly it points out the advantages of the anti-friction bearing "LiftAbout"—a hoist in which all of the leading features of modern design are incorporated.

Illustrations show the LiftAbout in operation in various kinds and types of plants and particularly illustrate the adaptability of the LiftAbout hoist to low headroom conditions, for use in places where dust, dampness and fumes are a factor, and so on. Principles of design are completely revealed through the use of drawings and "cutaway" half-

tones. Copy free upon request.



Lewis-Shepard Lift Trucks and Lift Truck Platforms. A new, small, colored folder—No. 322—describing and illustrating the lift trucks and lift truck platforms made by Lewis-Shepard Company, 267 Walnut St., Watertown, Boston, Mass., is now being distributed by that company. The folder points out the features of the skid platforms, such as the one-piece steel frame, arc welded construction, solid steel supports, smooth flush wood tops, steel binding all around, absence of bolt holes to split boards, floating platform boards, double strength side girders. Copy free.



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radially, from center outward or reverse, feeds automatically, and covers faces
6" to 30".

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Century Slip Ring Motors. This eight page folder describes and illustrates the line of 1 to 350 h.p. slip ring motors manufactured by Century Electric Company, 1806 Pine St., St. Louis, Mo. These motors are recommended by the manufacturer for any application for which the characteristics of a wound rotor motor are suitable, such as, for fans and blowers, holsts, conveyors, pumps, elevators, and so on. The motors are built for continuous duty, open and enclosed ratings, or for intermittent reversing application, short-time duty rating, and are available in open, drip proof, splash proof, fully enclosed and gear head types for horizontal and vertical operation. Copy free upon request.

Washer Data Chart. The Wrought Washer Mfg. Co. has announced the publication of a special washer data chart available to manufacturers upon request. This specification table, printed on heavy index bristol and suitable for hanging in stockroom, warehouse, engineering department, production department, and so on, contains complete size and dimension data of the entire range of standard wrought washers, including outside diameter, inside diameter, gauge and fraction equivalent, and pieces per pound. The more frequently used washers are illustrated in actual size, thus enabling easy identification of a washer of unknown size by merely holding it against the printed illustration. The use of this chart in any department of a manufacturing organization is said to save time and prevent the selection of wrong washer sizes for a given production or maintenance job.

Copy free to any mechanical executive who will address a request on his firm letterhead to The Wrought Washer Mfg.

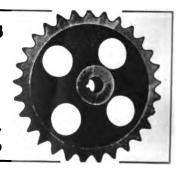
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"Nameo Taps and Dies" is the title f a booklet which presents the line of nterchange Die Heads with quick renovable circular chasers and collapsing ups now being manufactured by The Cleveland. ational Acme Company, The greatest advantage of the hio. rcular chaser head is the simplicity of onstruction, and there is only one adstment—which is for pitch diameter. is not necessary to adjust each of the basers individually or separately; all of them are simultaneously moved to the me setting by one simple adjusting echanism, which is graduated for the The different crator's convenience. yles and sizes of Interchange eads and Collapsing Taps are illusated and described in detail and tables specifications are included. Copy free pon request.

"Copper Alloy Bulletin", which is to a issued henceforth at regular interuls by the Bridgeport Brass Company, ridgeport, Conn., makes its appearance that the March issue. The bulletin is litted for a technical and engineering idlence. The first issue contains a district of news of interest to industrial insumers of copper and its alloys, and future issues will reveal trends in the major industries served by copper and its alloys. It will report news of markets, trends, government specifications, technical developments, new applications to executive, sales, and engineering staffs of the users of copper, brass and bronze. Copies will be malled free tions and other news of general useto interested executives and engineers.

Fine Steels Book By Ludium. *Bearing the title, "Fine Steels by Ludium," Ludium Steel Company, Watervilet, N. Ludium Steel Company, Watervilet, N. And Freently published an attractive, pocket size book containing a number of new charts, conversion tables and other useful facts. Included are a Tool Steel Finder showing how to select the correct tool steel for a particular job; also a Stainless Finder accompanied by a table showing the comparative resistance of each grade of stainless to the various corrosive agents.

Other data, gathered by means of physical tests and practical experience, cover Nitralloy and special products such as Hollow Drill Steel, Magnet Steel, Welding Rods for Hard Surfacing, etc.

Address Ludlum Steel Company for a free copy.



"There's One in Every Shop" By Wesser THROTTLED TALENT IF HE SPENT AS MUCH TIME ON HIS WORK AS HE DOES STUDYIN' THE BATTING AVERAGES, HE WOULD OWN THIS PLANT! WILL BE DIZZY IF TH BOSS CATCHES HERE'S TH HIM WAY DIZZY GROOVES 'EM IN IF THE BOSS COMES AROUND THE CORNER THIS BIRD WILL MAKE A HOME RUN! Burt Wesser

Celoron Silent Gears. How the noise of machinery in action can be quieted by the use of composition gears is told in an eight-page folder which is now being distributed by Continental-Diamond Fibre Co., Netark, Del. The folder explains the process by which Celoron Silent Gears are manufactured, gives specifications as to strength, Brinnel hardness, specific gravity, and so on,

and includes tables of gear tooth dates fe working stresses, horsepower rating per inch of face, and recommended practices for machining Celoron Gears. Copfree upon request.

Please mention MODERN MACHINE SHO when writing to advertisers. Your cooper tion will be appreciated both by the advertise and by the publisher of this magazine.

High-Speed Sensitive Precision Drilling Machine Bulletin. This bulletin, now being issued by The High Speed Hammer Company, Inc., Rochester, N. Y., presents the High-Speed Sensitive Precision Drilling Machine made by this firm. The bulletin describes the construction of the machine and includes specifications. The second page of the bulletin presents a cross-section drawing of the machine illustrating the spindle thrust bearings, the design of the spindle, the manner in which the pulley is assembled and drives the quill. construction of the column can easily be seen from the drawing, also the manner in which the machine is designed so that all pull from the belt is absorbed by the precision-mounted ball bearing quill. Copy free upon request.

Weldolets and Thredolets. Bonney Forge & Tool Works, Forged Fittings Division, Allentown, Pa., has issued Bulletin WT23, fully illustrating and describing WeldOlets and ThredOlets, the patented, drop-forged pipe fittings for making branch pipe connections by welding.

The manufacturer claims that by using these fittings, branch lines may be taken off the main pipe without any cutting, threading or fitting of the main line, either before or after it is in position.

No special training is needed for their installation—any welder of average experience being able to do a first-class job with the assurance of obtaining leak-proof joints.

They are suitable for use in all types of piping installations, either inside or outside, being especially adapted for use as radiator take-offs, for header construction in heating systems, in power plants, oil refineries and welded plumbing systems, etc.

ing systems, etc.

A copy of the bulletin will be mailed

on request.

Ideal Catalog Lists Additional Products. The demand for the catalog of the Ideal Commutator Dresser Company, Sycamore, Illinois, not only as a buying reference, but as a book of valuable information showing equipment, materials and methods which save money, has been so great that a revised edition becomes necessary at this time.

A revision was also necessary in order to furnish information on many improvements on old products, as well as to include a number of new products and equipment for which a definite need has existed.

Among the new equipment are a new washer punch, rotary stripper, turning tool head, air gap gauge, wire stripper, and the Ideal Marshall Voltage and Speed Regulator.

In addition to a complete listing of its products, the new catalog includes much interesting data on electrical and motor maintenance written by expert engineers. Copy free upon request.

Health Protection of Welders. Developing as a phase of blacksmithing, the extension of the processes of welding, cutting, burning, and coating of metals by means of a gas flame or by the electric arc has been rapid through the entire field of industry wherever metal construction and machine manufacture and repair are involved. ingenuity of American engineers is continually being applied to broadening the uses of these processes, which have already revolutionized the building and repair of metal machinery and products and greatly lessened the cost of much of our present-day equipment.

In recent years these operations have been applied to a variety of different metals, the effect of which on human beings is not widely known, though our knowledge of these effects is being constantly expanded.

A rather complete compilation of present-day information on health hazards connected with welding operations has been made by the Industrial Health Section of the Metropolitan Life Insurance Company in the form of a report entitled "Health Protection of Welders:" It discusses the types of welding and lists four principal hazards that are encountered: (1) Electric Shock and Burns, (2) Radiant Energy (roughly classified as ultra-violet rays, infra-red rays and visible light rays of excessive intensity), (3) Gases, Fumes and Dust, (4) Miscellaneous, which includes such hazards as the possible exhaustion of oxygen in the air breathed due to pollution by products of combustion in confined, unventilated spaces. These various hazards are discussed in some detail in the booklet and protective measures are outlined. Methods of treatment are also considered.

Copies of "Health Protection of Welders" are available from the Policyholders Service Bureau, Metropolitan Life Insurance Company, One Madison Avenue, New York, N. Y.

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"OVER THE ROUGH SPOTS". A guide to successful methods of keeping factory floors, roofs, walls and foundations in good repair has been issued by the Stonhard Company, 401 North Broad Street, Philadelphia, Pennsylvania. The book contains 24 pages, profusely illustrated, and is designed so that plant superintendents, maintenance men, and purchasing agents can gather a wealth of information from its pages. Among subjects discussed are "Lengthening the life of concrete and wood floors", "Leveling rough spots and worn places in all types of floors and trucking aisles", "Roof waterproofing methods", "Waterproofing masonry against hydrostatic pressure".

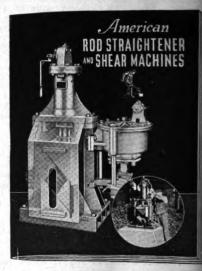
A copy of this book will be sent to any plant executive upon request.

American Rod Straightener Bulletin. Bulletin No. 10 on the American Rod Straightener and Shear Machine has just been released by The American Foundry Equipment Company, 555 South Byrkit Street, Mishawaka, Indiana.

The American Rod Straightener and Shear Machine is supplied in four models—one for every size shop. It is designed for reclaiming bent rods, bolts, wire nails, strip stock, etc. Materials

are straightened by means of mangane alloy steel dies which strike the wo with great force on four sides slim taneously. Operation is by compress air.

The machine will also form or recla gaggers. Shearing is accomplish



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through use of two high carbon to steel blades, each blade having eight usable cutting edges.

Skilled labor is not required for to operation of this equipment. Productic is high, as these machines operate rapidly as material can be fed into ther

Information contained in this bool let is brief but informative. Feature models, operations, and installations at thoroughly covered photographically. copy of this bulletin may be obtained toommunication with the manufacture

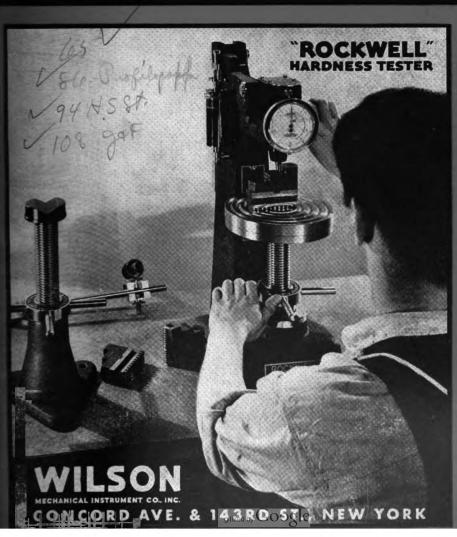


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MODERN September, 1937 Machine Shop





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HOWARD CAMPBELL, Editor

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Mechine Shop

CINCINNATI, OHIO

SEPTEMBER, 1937

Vol. 10, No. 4

Maintaining Production by "Banking" Stock

From the "lot" system to continuous production and thence to reserve banks has been the record of progress in material handling in the automobile industry

By E. W. Soesbe

Plant Layout Engineer, Chrysler Corporation

POR more than twenty years the production of parts in the larger automobile factories has been based on the system of material handling known as "continuous production," which consists principally in having the machines and equipment so placed that, upon completion of an operation on a work-piece, the piece is immediately passed on to the next workman for the next operation. This system is practically ideal, but it presupposes that all equipment not only is, but will continue to remain, in ideal condition.

Every effort has been made, through these years, to achieve this ideal condition. Extra sets of tools have been maintained at the machines to replace any which might fail. Extra parts for the machine tools have been kept on hand, and one large plant was said to have maintained a complete duplicate set of machines so that in case of ma-

chine failure the broken-down machine could be replaced at once with a good one.

With all these precautions, however, it has been impossible to prevent delays, and in the modern automobile plant even a few minutes delay on one operation may mean just that much delay on all subsequent operations. with scores-if not hundreds-of men idle and waiting for production to resume. With not only production lines, but departments and even whole plants geared together on a definite production schedule, this delay may cause more confusion and loss than such a small matter would seem to indicate, and certainly more than is apparent on the surface.

The machine tool of today is more productive, more sturdy, and more trouble-free than ever before, and the same may be said of cutting tools and equipment generally. Yet, as anyone

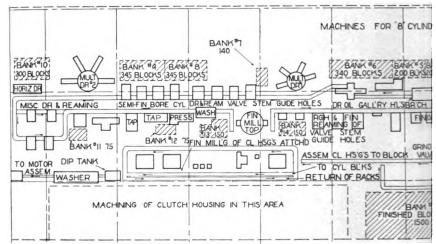
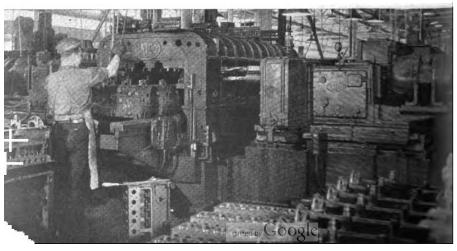


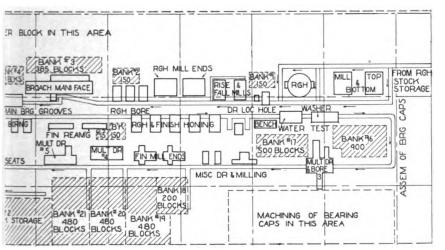
Fig. 1-Floor plan of cylinder department in a large automobile factor

whose responsibility it has been to maintain an even flow of production from the end of a machine line knows, it seems impossible to coordinate all factors so as to obtain continuous production for indefinite periods. Each machine, each tool, and each operator is a potential source of delay from a production standpoint, and even the

parts themselves are often at fault. In an effort to insure continuou production in spite of delays, the planning department of one of the large automobile plants has retreated step, one might say, from the protuction planning, by providin floor space at certain points in the production of the production planning.

No. 2—The Natco progressive fixture type boring machine, with a corner of bank No. 16 shet ing at lower right. This Natco is one of the key machines in the cylinder block line.





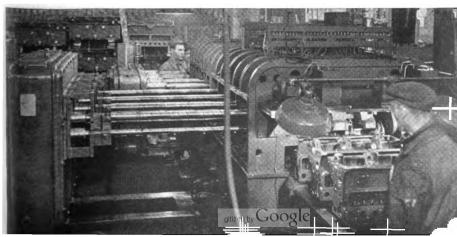
showing arrangement of production machines, conveyor, and storage banks.

duction lines for reserve "banks" of stock. These banks will, in case of breakdown, provide parts for the production line and thus permit production to be maintained, the only loss being for the operation immediately affected. An analogy could be found in a hydraulic line with a number of storage reservoirs from which the

liquid could be drawn in case of stoppage in any given section of the line.

Floor space, valuable as it may be, is economical compared to the expense of maintaining extra equipment—and the extra equipment also requires space. The "bank" will, in many cases, become the deciding factor in obtaining maximum efficiency from a given

Fig. 3—View of the Natco progressive fixture type boring machine from opposite side. Bank No. 16 can be seen over the top of the machine.



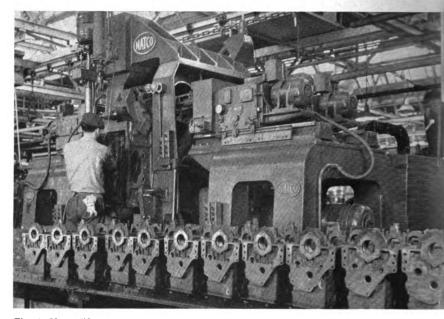


Fig. 4-Natco "drum-type" drilling machine. At the time the picture was taken, a few block had "banked" up ahead of the operator.

group of machines; thus consideration should be given to the bank system before new equipment is proposed.

Perhaps no finer example of the advantages of the "bank" system could be found than the cylinder block machine line in the plant to which reference is made. Cylinder blocks, being heavy and bulky, always present a problem from the handling angle, and the machine line is, in this case, relatively long with a number of highly complex machines included. The drawing Fig. 1 is a floor plan of the department, showing the arrangement of the machines, roller conveyor, and storage banks. Incidentally, this arrangement of the equipment, including the "banks," proved successful to the extent of a net gain of 15 per cent in the production over the previous layout.

In making the layout, it was found

that the machines varied greatly in size and there was, by necessity, a considerable amount of space left behind the smaller machines. Advantage was taken of these spaces for the banks, and thus the total linear length of the line was not increased. A list of the major operations in sequence, with the "banks" and their capacities is as follows:

Rough Milling of Bottom, Top and Ends
No. 1 Bank—150 blocks
Drill Locating Holes
No. 2 Bank—150 blocks
Rough Boring of Cylinders
No. 3 Bank—385 blocks
Broaching of the Manifold Face
No. 4 Bank—200 blocks
Broaching of the Main Bearing Grooves
No. 5 Bank—200 blocks
Drilling of the Oil Gallery Holes
No. 6 Bank—340 blocks
Multiple-station drill No. 1
No. 7 Bank—140 blocks
Drilling and Reaming of the valve stem guide
holes



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Milling Milling Machines

No. 8 Bank-345 blocks Semi-finish Boring of the Cylinders No. 9 Bank-345 blocks Multiple-station Drill No. 2 No. 10 Bank-300 blocks Miscellaneous drilling and reaming No. 11 Bank-75 blocks Tapping of all holes No. 12 Bank-75 blocks Washing, Pressing of valve guides, and Welch Plugs No. 13 Bank-150 blocks Finish Milling of the Top No. 14 Bank-150 blocks Rough and Finish Reaming of the valve stem guide holes, and Finish Boring and Reaming No. 15 Bank-150 blocks Rough and Finish Honing, Washing, and Assembling of Bearing Caps No. 16 Bank-900 blocks Multiple-station Drilling and Boring Machine

Multiple-station Drilling and Boring Machine No. 3
No. 17 Bank—500 blocks
Miscellaneous drilling and milling
No. 18 Bank—200 blocks
Finish Milling of the Ends
No. 19 Bank—480 blocks
Multiple-station boring and reaming machine
No. 4
No. 20 Bank—480 blocks
Multiple-station boring and reaming machine
No. 5

No. 21 Bank—500 blocks
Miscellaneous operations such as hand reaming, pressing in bushings, and grinding the

valve seats
No. 22 Bank—1500 blocks (Pinished cylinder block storage).

The space for storing the reserves had to be arranged with all the factors of the layout taken into consideration, consequently the banks are, in some cases, smaller than was desired. Bank No. 7 was one of these. Coming, as it does, directly after "multiple station drill No. 1"-one of the key machines in the line-it would be desirable to have a larger reserve. However, the next operations, which are those of drilling and reaming the valve stem guide holes, cause very few delays and so Bank No. 8 was considered to function as part of No. 7.

In general, the largest storage "banks" were located just before and after the key machines, such as the multiple-station multiple-spindle drills shown in Figs. 2, 3, and 4, the hydraulic broaches, and the cylinder boring machines. These machines perform

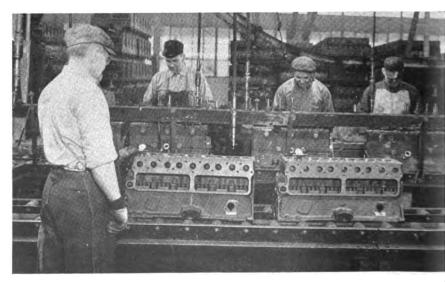


Fig. 5—Valve seat grinding operation, showing a part of bank No. 22 (finished blocks) in the background.

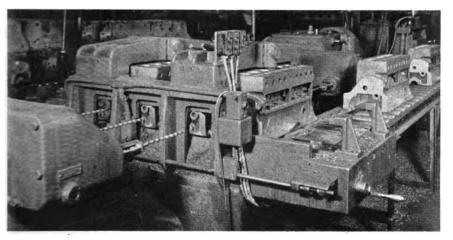


Fig., 4—Two-way horizontal drilling machine with a progressive-type fixture for drilling the oil gallery holes. In the immediate background can be seen part of bank No. 5. Bank No. 4 is the other side of Bank No. 5. but at the time the picture was taken it contained no blocks.

the most exacting operations and require the most care for both operation and maintenance. Conversely, where the operations are performed on single spindle drills, where there is a battery of machines performing identical operations, or where the operations consist largely of hand work, little if any bank is provided. A hand operation of the type referred to is illustrated in Fig. 5.

In addition to the major storage areas, short sections of roller conveyor were placed between the machines in several places. These sections provide for the storage of six to eight blocks adjacent to the main production line for filling in on short delays.

Facilities for handling the blocks with the minimum amount of labor were also carefully studied as an important adjunct to the layout. All of the larger areas are serviced by bridge cranes with air hoists. Spurs of roller conveyor project sufficiently close to the bank areas to reduce the horizontal movement of the cranes. Thus a block can be lifted from a spur of roller conveyor and deposited

on the bank pile with a minimum of walking and manual effort.

From the success that has been obtained with the use of "banks" in automobile production, it is the writer's opinion that the use of storage banks will prove a decided advantage in the operation of any long machine line operating on a continuous production schedule. The more such a line is crowded to capacity, the more advantageous the bank system becomes. This fact is even more true when the parts are of a size that compels space consideration for the accommodation of any particular number.

However, the limitations of storage banks must also be carefully watched. They should be truly a reserve, and in no case should they interfere with the regular movement of parts from one operation to another. The effect of tying the operations together so that each operator takes the part in process from the man just ahead of him and delivers it to the waiting hand of the next man is very stimulating when everything is working smoothly. The operations that are most completely mechanized set the

pace and the others must keep up.

If the storage banks can, to some extent, be set away from the main flow of production, the best situation is created. If access to the bank is unimpeded only when the blocks are really needed, the men will be kept from using these blocks when they should be working only on those that are coming through in the normal course of production. In this way the stability of the line as a whole is maintained without fluctuations in the production from any one or group of operations due to differences in the speed of the operators.

The results obtained by the adoption of the "bank" system will, of course, vary widely with the applications. It is only one of the factors in efficient layout, and must be considered along with the length of the line, dimensions of the machines, size of the part, number of close-limit operations, and other factors. Nevertheless, mere floor space, when thus considered, can be a great aid in leveling not only the ebbs and swells, but also the larger surges of production.

What To Do For That Burn

F IRE is used daily in almost every machine shop for tempering, heat treating, welding, forging, in washing machines, drying ovens, and many other places. That burns will occur sooner or later, in spite of all precautions, is practically a foregone conclusion and proper preparation should be made for such an eventuality. little knowledge may prevent further damage being done and help to simplify matters for the doctor.

Burns are commonly classified according to three degrees: (1) reddening, (2) blistering, and (3) deeper destruction of tissue.

The first impulse of many laymen who have had no training in first aid

is to smear the burn with any grease that happens to be handy. While a first degree burn of limited extent may be treated with any of the common burn ointments on sterile gauze. the use of a thick, greasy ointment on a deep or extensive burn will interfere with the doctor's treatment later. Another burn dressing to be avoided is carron oil, which is likely to carry infection. Carron oil is a mixture of linseed oil and limewater. in frequent use in European plants for burns.

Where picric acid, gauze, and clean water are available, a satisfactory dressing can be applied. The gauze should be wet and should be applied several layers thick over the burned area, bandaged in place. Picric acid is a good emergency remedy, but many doctors and surgeons prefer other remedies for continued use.

Tannic acid should be used only in a fresh state, as it will turn to gallic acid if kept standing. To have it on hand ready for emergency, one ounce of tannic acid may be sealed in a glass bottle to be added to one quart of warm, clean water at the first aid station. It may be applied with an atomizer or on sterile gauze pads, the spraying treatment being preferred by most physicians. The solution should be sprayed directly on the burn and on the skin around it. The sprayed part will then turn a dark brown, but the patient will experience a marked relief from the pain.

The spraying should be repeated every fifteen minutes until the doctor arrives, and the treatment is continued at the hospital or at home under the doctor's direction. The spraying treatment is particularly suitable for large areas of skin on the trunk and thighs. For burns about the face and eyes the spray should be replaced by a water-soluble tannic acid jelly.

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Operations in sequence include:

I-Drill and Tap four 5%" holes, two 21/32" holes.

2-Drill and Tap four 1/2" holes, two 3/16" holes, 1/2 CT. bore.

3—Drill one 31/32" hole in one

4-Drill one 31/32" hole in other



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The 5 ft. machine shown in the close up handles drilling and tapping operations on a cast iron knife support for a Flat Shaving Machine. Working to limits of +-.002", the time per piece is only 45 minutes.

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THE CINCINNATI BICKFORD TOOL CO.

The Bending of Wrought Steel and Wrought Iron Piping

Successful bending of large pipe requires a peculiar skill. This article tells how it is done at the Midwest plant

BY GEORGE BANGE

THE layman on a trip through a refinery, or a distillery, or a large chemical plant soon discovers that he is surrounded on all sides by coils.

plant as the Midwest Piping and Supply Co., Inc., St. Louis, Mo., a pipe bender works many years as a helper or apprentice before he is allowed to

take charge of a pipe bending table.

Fig. 1—Heating end of pipe prior to forming flange by "Van Stoning" method.

loops, and curves of huge pipe. If he is mechanically-minded, he soon begins to wonder by what process these loops and bends were made. Anyone who has tried to bend tubing or piping of small diameter has discovered that "you have to know how to do it", and the larger the pipe, the greater the necessity for skill becomes. In such a

The principal business of the Piping Midwest and Supply Company is the fabrication of wrought steel and wrought iron pipe, which includes bending, coiling, flanging or lapping, and welding. This work is done to the customer's drawings and specifications and

covers everything from a simple pipe bend or coil to a completely-fabricated power plant, chemical plant, or refinery installation. In addition to the pipe fabrication, this company manufactures a complete line of welding fittings, and both fittings and pipe are shipped to practically all parts of the world.



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Spindle and spindle sleeve are of "Nitralloy" steel nitrided for extreme surface hardness. The spindle is ground and the sleeve is honed to precision limits. These units being hardened are practically

impervious to wear. The hardening of these members also permits a much closer fit, resulting in a precision mounting that lends itself to the most accurate drilling and boring for tool room operations, including jig boring.

The driving sleeve is mounted on Timken Precision Roller Bearings at top and bottom with provision for take-up in case of wear. This construction insures not only a friction-free drive but also one in which the original accuracy can be easily maintained for many years.

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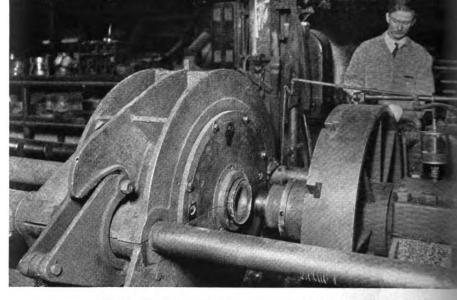


Fig. 2-Van Stoning machine with pipe in position.

The standard specifications for lapwelded and seamless steel pipe for high temperature service calls for minimum tensile strength as follows: Welded pipe.......45,000 lb. per sq. in. Seamless pipe,

grade A48,000 lb. per sq. in.

Seamless pipe,

 quired, these specifications must be met. Bending operations on pipe that is 18 in. or 22 in. in diameter are a common occurrence, and bends have been made in pipe of 30 in. diameter.

The pipe shop has four bays, each of which is served by a traveling crane. In addition, motor operated jib cranes are located where they will be accessible to the machines and bending tables. There are several

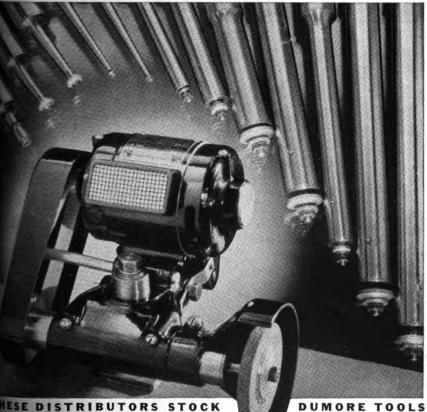
Fig. 3—Pipe heating furnace with pipe in position. The top of the furnace is made in sections which are counterbalanced so that any part or all of the top of the furnace can be epened.

The pipe shown has been heated to a white heat at the part which is to be bent.



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tables of various sizes, each of which has its own furnace for heating the pipe, and power capstan to pull the cable when the pipe is in position for bending.

Large and heavy pipe intended to withstand high pressures and high temperatures when fabricated is usually made up with flanges on the ends so that several lengths can be bolted can be seen, the furnace is of cylindr cal shape, consisting of a steel drun lined with fire bricks. Eight burner are used, being spaced equally about the exterior and located toward the front end.

A close view of the Van Stonin machine, with a length of pipe locke in the machine, is shown in Fig. ...
The flange has already been forme

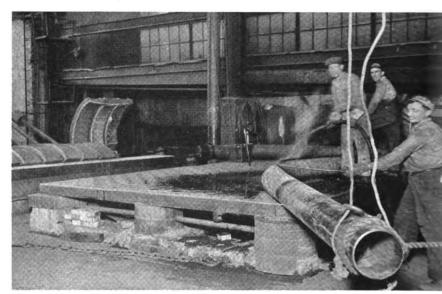


Fig. 4.—The pipe bending operation in process. The pipe is bent to fit the templet, water bein applied to cool the pipe and control the bending. By bending, then cooling, then bending again the desired curve is obtained.

together. The flanges are formed by rolling the end of the pipe, after heating, under pressure. This method of forming flanges is known as "Van Stoning", after the originator of the method, and the machine is called a Van Stoning machine.

Before placing the pipe in the machine for Van Stoning, the end of the section is heated to a cherry red heat in a gas burning furnace such as that shown in Fig. 1. The Van Stoning machine can be seen in the rear. As

by the Van Stoning process. To form the flange, a "wabbler" is anchored to the faceplate of the machine am power is applied to revolve the spindle while at the same time power is ap plied to force the wabbler into an against the end of the pipe so that the soft, hot end of the pipe will be spread by a sort of spinning process. The wabbler, indicated by the arrow, is hinged on a universal joint and at the same time is off-center from the center of the spindle so that as it reolves, it also bears against the wall f the pipe in the inside and spreads he metal until the flange has been ormed. The face and edges of the anges are finished by turning in a athe.

As everyone knows who has ever ent any pipe or tubing, it is practially impossible to bend pipe and hold to its original cylindrical form. As a pipe is bent, the natural tendency for the metal on the outside of the nurve is to flatten against the inner wall, rather than stretch; thus it is practically impossible to bend a holow pipe empty without having a flat" at the curve.

To avoid this difficulty and force the pipe to retain its cylindrical form, the pipe is filled with some substance which will force it to retain the cylindrical shape and at the same time allow the metal on the outside of the bend to stretch. The most common filler is sand and it is sand

Fig. 5—The amount and speed of pull on the pipe is controlled by tightening or slackening the rope around the constantly revolving capstan.

that is used on these large pipe sections. Before placing the pipe in the furnace to be heated, one end of the pipe is closed and the pipe is then stood either on end or vertically at an angle of 45 degrees—usually depending upon the length of the pipe—and sand is poured into it from an overhead hopper. When the pipe is practically full, the open end is also closed and the pipe is ready for heating and bending.

To bend a large pipe section, that portion of the pipe that is to be bent is heated in a furnace especially designed for this purpose. The furnace is of long, low construction and gas is

used as fuel, thirteen gas burners being set into one of the walls and close to the bottom. The top of the furnace, as shown in Fig. 3, is made of sections, counterbalanced and hinged so that any part or all of the top of the furnace can be opened in order to insert or remove a pipe. The illustration shows the top of the furnace completely open and cables slung around the pipe—which has been heated to a white heat—preparatory to removing it from the furnace and placing it on the bending table.



Figure 4 shows the actual bending of the pipe. The bending table is of cast iron, approximately 4 in. thick. Holes of 2-in. diameter are arranged in rows approximately 8 in. apart so that steel plugs can be inserted at practically any point in the table to block the pipe and hold it in required positions for bending. The overhanging portion of the pipe is, as shown in the illustration, suspended by cable from the overhead crane and the actual pull to bend the pipe is exerted by a rope cable attached to the pipe and wound around the capstan shown in Fig. 5. The capstan revolves con-



Fig. 6—Pipe of 6diameter or less bent cold in this a chine.

tinuously, the amount of pull on the cable being controlled by the operator. A slight tightening of the rope around the capstan by the operator is sufficient to exert a tremendous pull at the other end of the rope, and by experience he has learned to know just when to pull and when to slacken the rope so as to bend the pipe the exact amount required.

One of the workmen in Fig. 4 can be seen holding a templet which has been made by bending a rod to the exact curve required. The templet can be made up ahead of time and thus no time will be lost in bending the pipe to the required arc after it has been heated. Even on very large pipe, such as shown in Fig. 4, bends are made within very close limits.

With the steel plugs holding the pipe at the rear end and the cable pulling on the front end, a great deal of skill and many years of experience is required to control the bend. The man in charge of the bending table can be seen standing on the table with a hose in his hand, spraying water on the bend as the operation

proceeds so that the bend will be made in exactly the right spot.

Another bending table is shown in Fig. 6. This one however, is mostly used for bending pipe cold, which can be done with certain kinds of pipe up to 6-in diameter. The rollers are anchorons of the table

rollers are anchored to sliding sections of the table which makes it possible to adjust the rollers so as to obtain any radius required. The rollers are, however, removable and inasmuch as rollers having different radii must be used for the different sizes of pipe, there are complete sets of four rollers each for all of the different sizes in use.

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"Buff and Composition Bulletin No. BC-104." This is the title of a bulletin which has been recently published by the Hanson -Van Winkle-Munning Co. Matawan, N. J. Pictures of the various types of buffs and compositions, plus a description of their uses, are included in this bulletin. Copy free upon request.

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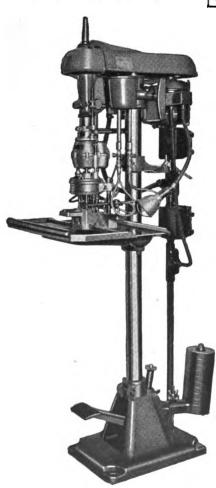
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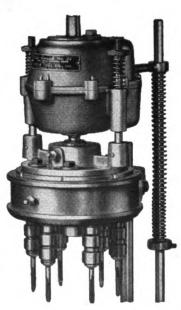
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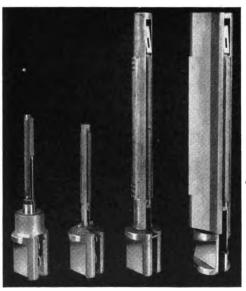


Fig. 1-Sunnen Hones in a variety of sizes.

REMOVING stock on a part for a device or mechanism of average size can be done down to within a few thousandths of an inch within reasonable limits of cost. As the limits of accuracy are tightened, the cost increases and thus it often costs more to remove the last thousandth of an inch of material than it did the first eighth of an inch.

The record of civilization's progress is a record of constantly increasing demands—demands for mechanical devices to relieve

hand tasks—demands for better mechanisms to supersede those of more crude design—demands for mechanical devices to make life easier—and demands that all of these things shall operate efficiently, automatically, and

September,

"The Last Ten-Thousandth

BY BARTLETT WEST

silently. And the demand is smooth, quiet operation of n chanical units is becoming in creasingly imperative.

Time was when an automobile coube heard coming blocks away. Tod the cars roll by so silently that t motor cannot be heard. Until recerly the word "streetcar" was synon mous with "noise"; today streetca are built that run almost silent! Practically all of these improvement can be credited to closer limits of design to the control of the street can be credited to closer limits of design to the street can be credited to closer limits of design to the street can be credited to closer limits of design to the street can be credited to closer limits of design to the street can be credited to closer limits of design to the street can be credited to closer limits of design to the street can be credited to closer limits of design to the street can be credited to closer limits of design to the street can be credited to closer limits of design to the street can be credited to closer limits of design to the street can be credited to closer limits of design to the street can be credited to closer limits of design to the street can be credited to closer limits of design to the street can be credited to closer limits of design to the street can be credited to closer limits of design to the street can be credited to closer limits of design to the street can be credited to closer limits of design to the street can be credited to closer limits of design to the street can be credited to closer limits of the street can be credited to closer limits of the street can be credited to closer limits of the street can be credited to closer limits of the street can be credited to closer limits of the street can be credited to closer limits of the street can be credited to closer limits of the street can be credited to closer limits of the street can be credited to closer limits of the street can be credited to closer limits of the street can be credited to closer limits of the street can be credited to closer limits of the street can be credited to closer limits of the street can be called the street can be called to closer limits of the s



Fig. 2—Sunnen Hone parts disassembled to show expanding mechanis

sign and better workmanship on the parts involved. Where limits of perhaps 0.005 to 0.010 inch were allowed a few years ago, 0.001 to 0.002 inch sthe rule today. Limits of 0.001 to 0.002 inch of a few years ago have

een reduced to perhaps 0.0002 incheday, and so on.

It is obvious, of course, that finer imits mean finer workmanship. It impossible to measure over a coarse

cut in terms of ten-thousandths of an inch; as the imits are tightened, the mality of the finish must e improved accordingly. Thus in developing ways and means to work to lose limits, it has been found that one of the best ways to remove the last bit of surplus stock, do it economically, and obtain the necessary quality of inish, is by abrasion. In other words, by the use of accurately made and accurately controlled abrasive stones. With a tool in which such stones are employed, the last ten thousandth inch of surplus stock can be removed economically and without great risk of spoiling the work.

Abrasive stones have been used for hundreds of years for removing infinitesimal amounts of stock, such as, for instance, in the sharpening of knives, swords, and other cutting edges. The advantages interent in the abrasive stone were recognized when the cylindrical grinder was developed for producing a smooth finish on exterior surfaces of cylin-

drical-shaped metallic parts. Grinding for close accuracy and fine finish on exterior surfaces has been customary for perhaps a couple of centuries. More recently abrasives have been used in the form of laps for the fin-

ishing of interior surfaces, but it has been only within the last fifteen years or so that scientifically-designed, mechanically-controlled tools in which straight sections of abrasive stones

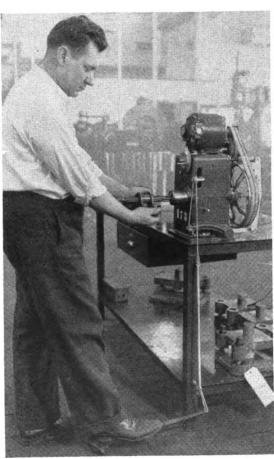


Fig. 3-Sunnen Honing Machine in operation.

are held have been used for this purpose.

Today the advantages of these tools—commonly known as hones—are well known and honing tools of the better class are used in all

branches of industry for the finishing of interior surfaces in all kinds of products from small bushings to large engine cylinders.

A representative tool of this type

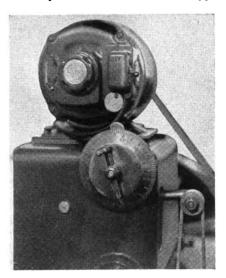


Fig. 4—Close view of setting dial on Sunnen Honing Machine.

is the Sunnen Hone, shown in Fig. 1. The tool or mandrel is shown here in four sizes, to illustrate the manner in which it can be adapted for various sizes of work. These mandrels each carry one stone that is attached to an expanding holder and is guided by two solid cast guide shoes. The smallest size hole that can be honed is

0.375 in. diameter and the largest, u to this time, is 2.400 in. diameter. These hones will work in all metal except babbitt with an accuracy of 0.0001 in. for roundness, straightness and taper in holes 0.375 in. to 0.720 in dia. x 4 in. long, and in holes from 0.720 in. to 2.400 in. dia. x 7 in. long

The hone shown in Fig. 2 has been partly cut away to show the mechanism by which the expansion is obtained. When used in the Sunner Honing Machine, shown in Fig. 3, the expansion is controlled automatically by the machine according to whatever setting is made on the dial at the from of the machine. A close-up view of the dial is presented in Fig. 4.

Each stone is held in its own holder upon the sides of which are three pro jections that engage the three tapered surfaces of the wedge, as shown When the shank of the in Fig. 2. mandrel engages the spindle of the honing machine, the end of the wedge locks with an adjusting link which is controlled by a foot lever, shown in Pressure on the foot lever moves the link horizontally and thu operates the wedge, which in turn ex pands the hone. Full pressure on the foot lever wiil expand the hone to it maximum setting; by adjusting the dial at the front of the machine, shows in Fig. 4, the setting of the stone car be adjusted by ten-thousandths of ar inch.

When the operator is ready to pro-

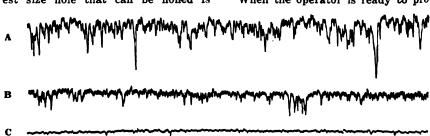
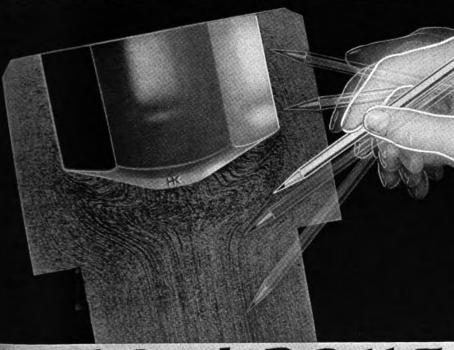


Fig. 5-Profilographs of bored. rough honed and polished hole surfaces.

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ceed with the job, he selects the size of mandrel and grade of stone best suited for the task in hand, locks it in position in the honing machine, and then adjusts it, by means of the dial, until it will just fit the hole that is to be finished. With the machine in operation, the workpiece is moved back and forth over the hone until the hole has been finished to the maximum diameter afforded by the setting of the stones. If the hole is still too small, the adjustment is corrected by means of the dial and the honing

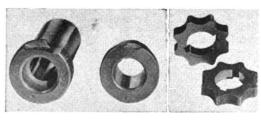


Fig. 6—(Left) The finish and accuracy required in drill jig bushings can only be obtained economically by honing. Fig 7—(Right) An example of carburized steel parts that are finished to fine limits by the use of the

operation proceeds. This operation is repeated until the hole is finished to the desired size.

As pressure on the foot lever is released, the link moves backward, pulling the wedge with it and allowing the stone to "collapse." As pressure is applied to the foot lever, the link is projected, pushing the wedge with it and forcing the stone to the maximum diameter afforded by the setting of Thus, after a setting has the dial. once been made, the stone will be expanded only the amount desired when the foot pedal is pressed down and, accordingly, all the workpieces can be finished to size at maximum speed. the only setting required being that necessary to compensate for the wear of the stones.

Ordinarily, where there are several thousandths inch of stock to be re-

moved from a hole, a roughing stor is used to remove all but the last fration of a thousandth and then th stone is changed for a finishing ston Where a large quantity of pieces of the same kind are to be finished, it customary practice to rough all them first and then finish all at th same time. It is important that the last cut in the hole be very ligh The finishing stone can be used in mediately following the machining co where the cut is smooth enough s that the desired finish can be of

tained by the removal of no more than 0.001 in. of stock Where a highly-polished fin ish is desired, a polishin stone is used after the finish ing stone. The stones ar never used dry; lard, oil o special grease in stick form is applied to the stone sur faces frequently in order to obtain the best results. Dry stones wear rapidly.

A good idea of the differ ent types of surfaces that are produced by the use

of different types of tools is afforded by the reproductions of the profile graphs presented in Fig. 5. The instrument with which the profilograph record is made consists primarily of a very fine diamond point, which moves over the surface to be recorded, and a series of lenses and mirrors which reflect and magnify the movement of this point onto a sensitized paper. The profilographs shown here represent the surfaces of various types of a cast iron cylinder wall magnified 2000 times in depth and 30 times in length.

The profilograph A is a record of a surface that has been finished with a single cutter boring bar, the record being made after the second cut. Profilograph B is a reproduction of the same surface after being ground with Sunnen roughing and finishing stones.



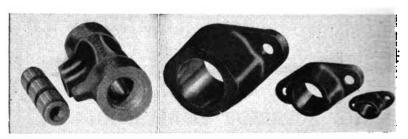


Fig. 8—(Left) Approximately 0.004 inch of stock is removed from this hole, producing a mirry finish within 0.0002 inch limit in from two to three minutes. Fig. 9—(Right) These Morse Chai Couplings are finished within 0.00025 inch of drawing size, removing 0.004 inch of stock.

Profilograph C is the same surface after being processed with Sunnen roughing, finishing and polishing stones. The polishing stones left a "mirror" finish.

As an example of the precision tasks for which the hone is used, note the "Universal" Drill Jig Bushings shown in Fig. 6. These bushings are of hardened tool steel and the holes are finished to a mirror finish, within 0.0001 inch of specified size. This finish and this accuracy can be obtained by the use of the hone at a manufacturing cost which makes these bushings economical for all jig users.

The rotor blanks shown in Fig. 7 are processed five at a time, the keyways being staggered so as not to damage the stones in the hone. These blanks are made from SAE 4615 steel, carburized, and the holes, which are 3/16 inch long, are finished 0.525. Approximately 0.002 inch of stock is removed in the operation and the diameter is held to limits of 0.0002 inch.

Figure 8 shows a cast iron vibrator body with a hole 2 inches long and 0.625 inch diameter. From two to three minutes time is required to remove 0.004 inch of stock, producing a highly polished finish within limits of ρ .0002 inch. Figure 9 presents several of the couplings that are used in fabricating the Morse chain. The couplings are of mild steel. The hole in the large coupling is 2% inch long

and 2.250 inch diameter; the hole is the middle coupling is 1-7/16 inch lon and 1.375 inch diameter, and the hol in the small coupling is % inch lon and 0.625 inch diameter. Approximately 0.004 inch stock is removed from each one of these holes and the diameter is held to a limit of 0.0002 inch in all cases.

Fairbanks-Morse Model 36-A Dies Generating Sets are presented in Bulletin No. 3600-A2, which describes an illustrates the contruction and application of these sets.

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High Speed Steel

The second article of this series, dealing with the physic properties of high speed steels and the factors which affect cutting ability

By J. P. GILL

Chief Metallurgist, Vanadium-Alloys Steel Company, Latrobe, Pa.

LL high speed steels are of a segregated nature, consequently the distribution of the segregates has considerable effect upon the characteristics of the steel. The segregate referred to, shown in the microphotograph, Fig. 1, is of the cast structure of steel A, referred to in Table I of the previous article as containing .55-.75 per cent carbon, 18.00 per cent tungsten, 4.00 per cent chromium, and 1.00 per cent vanadium. An analysis of this segregate showed that it contained about 3.00 per cent carbon, 4.5 per cent chromium, 65.00 per cent tungsten, and 4.5 per cent vanadium,

Fig. 1—Microphotograph of the cast structure of steel A in Table I, referred to in the previous article of this series. Analysis of the segregate aboved that it contained 3.00% Carbon, 4.5% Chromium, 65.00% Tungsten, and 4.5% Vanadium; remainder, Iron.

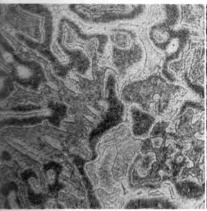
the remainder being iron.

The distribution of this segregate will depend upon the melting a casting practice to partially control in the ingot, and then upon subseque forging and rolling. The segregate always larger toward the center the ingot, which cools slower a smaller toward the outside due being chilled by the wall of the mou Comparisons of the center with toutside are shown in the microphot graphs Fig. 2 and 3.

The larger the ingot, the larger t degree of segregation, other factor such as temperature of the casting

mould design, and so on. h ing the same. The amou of reduction obtained in t forging and rolling may n indicate the segregate d tribution, since in produci a 1-in. round from a ve large ingot, no amount forging or rolling will bre up the segregate as well starting with a smaller ing having a smaller segrega and giving it less reduction in rolling and forging. Th segregate cannot be brok up by heat treatment. It can be partially dissolved heating to a high temper ture, but on re-annealing w appear in substantially tl same areas, unless the ten

95





ig. 2 and 3—Comparisons of structure of the center (left) of a high speed steel ingot with the structure near the outside (right).

erature has been so high as to fuse. After solidification of the ingot it an only be distributed by mechanical ork.

Hammering will tear the segregate part to a varying degree, while rollng or pressing will simply elongate he segregate without materially reaking it up. Hammering is, thereore, considered a necessary operation the manufacture of high speed teels. This segregate, actually a utectic, has a lower melting point han the remainder of the steel and rill fuse while the steel appears to be a solid state. The segregate will use at temperatures only slightly bove that used in heat treating, and hen the segregate fuses, the steel ill have something of the appearance f the cast structure indicated in

It is not easy to select the physical roperties of a high speed steel that will in all cases determine its adaptibility for a specific operation. We are a vague idea that it must have utting ability and should have the oughness but we usually think of these properties only as in comparison with some other steel. Most of

us think of cutting ability as the most necessary requisite of a high speed steel, so let us try and enumerate some of the factors or characteristics which determine cutting ability.

First—ability to resist softening at elevated temperatures, or in other words, red hardness. This is a most important property in a high speed steel since there is some temperature point at which the cutting edge of any high speed steel will become so soft that failure will take place immediately. This temperature varies considerably with different steels, but, in general, those steels that are most highly alloyed have the highest resistance to softening at elevated temperatures.

Harder and Grove investigated the hardness values of different high speed steels at elevated temperatures. A few of the hardness values they obtained are indicated in Table II. The conclusions of Harder and Grove as to the hardness of high speed steels at elevated temperatures are fairly consistent with the cutting properties as indicated in production.

Harder and Grove stated that a

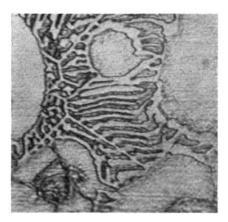


Fig. 4—Microphotograph of structure of fused segregate in hammered high speed steel. The segregate has a lower melting point than the rest of the steel and will fuse at a temperature only slightly above that used in heat

temperature of 1290 deg. F. appeared to be the most desirable temperature for hardness testing as a possible means of predicting cutting efficien-

cies. They stated that vanadium is effective in contributing hot hardness; that the 18-4-1 type is superior in hot hardness to a steel not containing vanadium, but that the 18-4-2 type shows higher red hardness values than the 18-4-1 type; that

cobalt added to any of the types further increased the hardness but that a cobalt content over 5.00 per cent did not seem to further increase the hot hardness (which is not consistent with cutting tests); that the addition of molybdenum did not increase the hot hardness of the steel, and that steels in which tungsten is wholly replaced by molybdenum have shown lower hot hardnesses.

Another excellent indication as the temperature at which a steel wibegin to soften is that of the tempering temperature to which the steemay be heated without loss of hardness. This varies from a low of about 1000 deg. F. for a molybdenum hig speed steel to a high of about 114 deg. F. for some of the most highl alloyed steels.

Second Strength and Toughness It is generally conceded that strength and toughness in high speed steel ar most important physical properties and for certain classes of tools probably are of more vital important than wear resistance or resistance to softening at elevated temperatures. The property of toughness varies over a wide range in the different types of high speed steels and, for that matter, even within the same type of high speed steel when the carbon content grain size and segregate distribution are varied. It has been proven that

TABLE II

Not Hardness of High Speed Steels

Steel		Tempering Temp. Deg. F.	Brinell Hardness at Elevated Tump. Degrees Fahr. 570 750 950 1109 1290				
					ı .	T ***	T
A 18-4-1	2350	1050	650	640	560	-	170
B 14-4-2	2300	1100	570	555	500	435	250
C 18-4-2	2350	1050	635	570	540	446	200
E 95 Mo. No W.	2150	930	670	590	565	465	190
G 18-4-1 •5% Co.	2350	1050	670	640	600	510	200
H 18-4-2 + 8€ Co.	2400	1100	655	සෙ	570	500	295
J 21-4-2 + 13≸ Co.	2400	1050	650	645	670	555	305

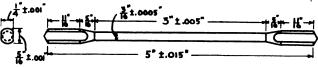
the failure of cutting edges of many types of tools is the result of minute chipping, thereby causing a building up of friction and pressure and resultant failure. This is distinctly noticeable in some of the cobalt high speed steels which are notoriously brittle.

Most of us do not have a very clear conception of toughness, possibly due



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to the fact that toughness in itself implies three distinct properties; namely, strength, deformation within the elastic limit or elasticity, and deformation beyond the elastic limit or plasticity. Different physical tests



-Drawing of Torsion Test Specimen

have been proposed for testing the toughness of high speed steels. Izod and Charpy tests are so inconsistent as to make them of little value. Something of an innovation on the impact test was proposed by Luerssen and Green in their so-called impact.

The static torsion test has been known and used for many years by most makers of small tools such as taps and drills. Often times the equipment for torsion testing has been of a home-made nature, and the tester has been primarily interested in comparing one material with another without any effort to arrive at any value that could be stated in a mechanical or physical term which would have any meaning to anyone not familiar with the method of testing. Emmons proposed a standard specimen for static torsion testing and suggested the term "coefficient of toughness" which was obtained as the product of the force or ultimate torque and the degree of twist. In making torsion tests using the method proposed by Emmons, one can obtain a diagram which is remarkably valuable in that it clearly shows the strength and plasticity of steels in the fully hardened condition.

The dimensions of the test specimen proposed by Emmons are given in the drawing, Fig. 5, and Fig. 6 is a typical chart showing how the results

are plotted. In this chart the torq in inch-pounds is plotted as the ore nate and the angular deformation, twist in degrees, is plotted as t abscissa. The dimension AB is term "elastic deformation," and the dime

sion BC is term "plastic deform tion." Streng within the elast limit is indicat by the dimension DE, and the ult

mate strength shown by the line CF.

The effect of carbon on the streng and plasticity of an 18-4-1 steel disclosed by the diagram, Fig. 7. T actual strength of the material wou

be indicated as long as the line r mained straight; where the straigh line breaks, the elastic limit of tl material has been exceeded and plast

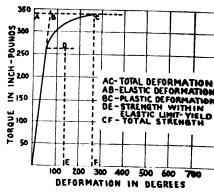


Fig. 6-Diagram showing how torsion results are plotted

deformation has begun.

It may be more valuable for a stee to show high strength and small plastic deformation rather than los strength and high plastic deformation For example: let us assume two high speed steel taps, one with high strength and small plastic deforma tion, and the other with low strengtl

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and high plasticity. The high strength tap may withstand torque to which it is subjected in the tapping of a hole and thus will not be bent, but the other tap, having high plasticity and low strength, may bend immediately when subjected to the torque necessary in order to cut the threads, and is, therefore, useless.

Third-Resistance to wear. The

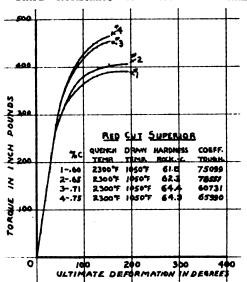


Fig. 7—Diagram showing effect of Carbon on strength and plasticity of an 18-4-1 high speed steel

ability of a high speed steel to resist wear is certainly of great importance in determining tool life. This property of high speed steel is most difficult if not impossible to determine with any degree of accuracy and reliance. A number of different types of machines have been designed for wear testing, and it is probable that no two people conducting these tests have ever made them in the same manner. Testing may be of a rolling or sliding nature, with or without an abrasive or lubricant. The same metal may be tested in contact with itself or with another

metal. When no abrasive is used on may be formed anyway as the product of the wear. This may be essentiall iron oxide, or it may even have som carbides present when high spee steels are tested.

It is well known that certain type of comparatively soft steels may sho better resistance to wear than the same steels when hardened, due to

change in structure and harden ing of the surface by plasti deformation. This cold working of the surface of a tool in oper ation may be one explanation to why results in cutting test may vary 200 and 300 per cen using the same steel with th same heat treatment and cut ting the same material. which show superior resistance to wear against another meta may not show the same result at all when the metal is change for a different metal. Observa tion as to cost of grinding fir ished tools of the several differ ent steels is a practical metho of obtaining some knowledge to their wearing qualities.

It is probable that the factor of resistance to wear or abrasion is some product or summation of the hardness an plasticity of a material, thu anything we do to increase the

plasticity of a material is probabl also increasing to some degree its re It is well know sistance to wear. that as we increase the temperatur of hardened steel within certain limit we are increasing its plasticity. ferent high speed steels may, there fore, have a different factor of tough ness at different temperatures an consequently their resistance to wes at any temperature under the soften ing point may vary considerably wit variation in temperature. This ma explain in part why highly-allow cobalt high speed steels usually sho



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much better results when tested under conditions where considerable heat is generated at the cutting point.

Fourth-Hardness. Hardness is an important physical property in high speed steel, one which is easily determined, and a property which is sometimes used as a measure of the toughness of a material since it is generally assumed (but not necessarily true) that as the hardness increases, the toughness decreases, and vice versa. In most instances cutting ability will increase with the hardness, but this is not always true, either. It is well known that with the cobalt high speed steels it is almost a necessity to have them intensely hard in order to obtain the best results. It is also interesting to note that during the last few years the average hardness of tools made of high speed steels has crept upward, possibly due to the use of better machines and more rigid set-ups. High speed steel tools need not necessar be intensely hard to give a good a count of themselves, which is in cated by certain classes of high spe steel chasers used in threading pi where the hardness rarely excee C 60 Rockwell.

It is obvious then, that cutti ability is dependent on a combinati of different physical characterist which we may name as follows be without regard to ranking them importance:

1. Ability to resist softening elevated temperatures.

2. Strength and Plasticity Toughness.

 Resistance to Wear or Ab sion at temperature operate

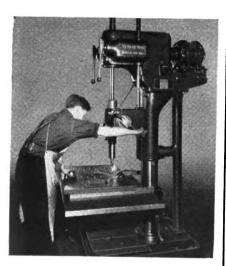
4. Hardness.

It is difficult to separate these properties one from another as to their ifluence on cutting ability as eabears a direct relationship with a other. All of these physical properties





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ties are greatly influenced by the hardening procedure and possibly to a lesser degree by the manufacturing procedure.

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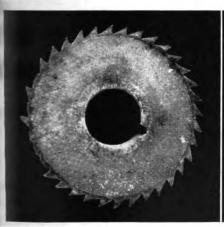




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By N. Warshaw

Chief Engineer, Lewis-Shepard Co., Watertown, Mass.

As told to Francis A. Westbrook

THE Lewis-Shepard Company manufactures products which can be used in almost all industries, provided the necessary variations are made to adapt them to the specific requirements peculiar to each. The result is that we must have a great many standard types and sizes, which in one line, at least, run up to well

Fig. 1-Drum Pouring Stand of Welded Construction

over seven hundred. With us, consequently, it is impossible to reduce costs of production by cutting down the number of standard items, and economies must be made in other ways in order to be able to sell at a reasonable price to our customers, and build up a good volume of business.

One of the greatest aids in the accomplishment of this very necessary result has been the extensive use of jigs and fixtures. And as electric welding plays a very important part in the fabrication of our products we have found that by employing this versatile tool we can make our own jigs and fixtures very inexpensively and greatly reduce manufacturing costs. Moreover, these jigs are used for both machining and welding op-

erations.

Of course the case for welded jigs has been adequately presented before, but the manner in which it fits into our method of operation may be suggestive of possibilities to others. All practical means of reducing costs are worth while, no matter what line of industry is involved.

It is pretty generally known that jigs and fixtures speed up work and that they make for the interchangability of parts. However, unless the number of parts to be produced is large, the cost of jigs and fixtures is

not usually justified, and the manufacturer gets along without them as best he may—generally at the expense of higher costs. But if some method of making them at a very low cost is available, the benefits to be derived are possible even where comparatively few parts are to be made. That is where making them by means of welding comes in with us. It is true that we have the important advantage



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of having a very complete welding department as a part of our production equipment, and a corps of skilled welders, but we are far from being alone in this at the present time.

What we actually do is to fabricate

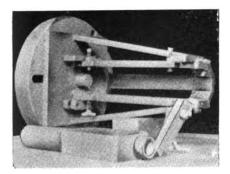


Fig. 2-Lathe Fixture formed by Welding.

jigs and fixtures from pieces of machine steel by means of electric welding. Naturally this is a very different matter from making patterns, molds and castings which must be machined. The only trick about this

is to make them square, and this is done by securely clamping the pieces in place and then welding a little at a time, working all around the joints so as to avoid uneven heating. This, of course, means that they are not expen-It is not sive to make. even necessary to make preliminary drawings, for the foreman of the welders is capable of making them from the drawing of the part in question.

In addition to the great advantage of cheapness, our experience has shown that there are other advantages which can be credited to welding. For instance, in the development of a new type of product, when the stage has been reached where it becomes desir-

able to make a dozen or so simila pieces, a jig is justified because of it low cost. If some change in the de sign of the item becomes necessary, as is very likely to be the case in develop ment work, it is a simple matter to change the jig by cutting, or by the addition of parts. Thus it is possible to make a first jig knowing that mi nor changes can be made later with out altering the important dimensions A new jig would almost surely have slight variations in dimensions from the original so that the parts made from the two would be lacking in ready interchangeability.

The foreman in charge of assembly work, in which welding as a fabricating tool is employed, knows better than anybody else in the shop how the jigs for welding operations are to be used. Since making up jigs by means of welding is such a simple operation, as compared with cast jigs this foreman is able to design them better than a draftsman who cannot know the practical details as well. It is also a part of his responsibility to



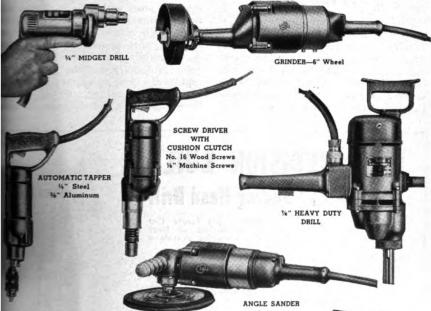
Fig. 3—Lift Truck Head Casting and Welded Jig in which It is Drilled

see to it that he has the most efficient means for his assembly work, so that this matter of providing jigs is quite properly a part of his job.

Furthermore, as already hinted at, it is not merely a question of welded jigs being easy to design, but they are made in the same way as many

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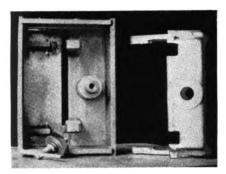


Fig. 4—Interior of Jig Shown in Fig. 3, Showing that Smooth Surfaces are Obtained without Machining

of the welded items in the production schedules, so the foreman is on familiar ground. He usually just makes a rough sketch from the working drawings and the welder works from this. This same foreman, being a versatile old-timer, also designs the jigs and fixtures used for machining parts in production.

The fact that jigs can be made quickly and inexpensively means that they are very extensively used, and we have them in the shop for almost every conceivable operation. We practically never have duplicates and they never wear out before the item becomes obsolete.

Another important advantage of welded jigs and fixtures is that many of the items fit against an inside surface which would be difficult to machine, if it were a casting, because of inaccessibility. With the welded construction, made up of pieces of machine steel with true surfaces, this internal machining is not necessary. Very often with a cast jig where the internal surface cannot be reached for machining, the piece has to be made separately and the parts bolted together. This, of course, is likely to result in inaccuracy. Or if the jig is dropped, the bolted type is more

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likely to be damaged than the solid type. It is also true that the welded jigs are -tiffer and far less liable to chatter, as well as being lighter in weight for a given strength.

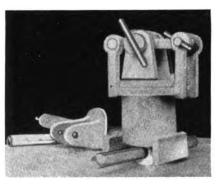


Fig. 5—Welding Fixture for Fabricating Handle Fork for Lift Truck. This Fixture is also of Welded Construction.

A few examples of some of the welded dies and fixtures in use in our shop will illustrate most of the points in the foregoing discussion. Fig. 1 shows a drum pouring stand which is very simply made up of a few pieces of steel, bent into shape and welded. An equally simple jig was made to facilitate fabrication. The jig is the same shape as the product, except that it is somewhat larger, so that the metal strips of which the stand is made fit inside of it.

The stand is made of lengths of angle iron bent into shape and with the sides notched to permit of bending properly, one strip for each side. These pieces are set in the jig (at the left). The only clamps needed are at the ends, and all measuring and squaring is eliminated. The cross pieces are merely laid in place. The inside of the stand is then welded and it is taken out of the jig and the outside welded. The jig costs very little to make and the manufacture of the product is greatly simplified.

Fig. 2 shows a fixture of welde construction, intended for use on th face plate of a lathe. It is both ligh and rigid, and is of a type which would hardly be practicable to mak in the form of a casting. It is use for the boring, reaming and tappin of each end of the hydraulic releas check head for certain types of life trucks. The shape of this piece is od and this is about the only reasonable convenient way of holding it in lathe. With this arrangement it is very easy matter to do the work of one end of the part and then take out, turn it around and work on th other end. Like all of the fixture this was comparatively inexpensive t make and is a great operating econ

Another jig of welded construction is shown in Fig. 3. This is for drilling the casting for the head of a litruck. It is made so that five hold can be drilled in each end without



Fig. 6—The Welding Fixture Shown in Fig. with the Workpiece Removed and Standing the Left of the Fixture.

removing the part from the jig. The whole thing is simply drilled on one end and is then turned over for the drilling of the other end. One of the contract of

They don't scrape

Simonds RED TANG Files have teeth like a metal-cutting saw . . . teeth that take off more metal with less elbow-grease. Chips roll off in coils as they do from a cutting tool on a lathe. RED TANG Files cut quickly, freely, a lathe. RED TANG Files cut quickly, smoothly. And they stay sharp much longer smoothly. And they stay sharp much crumble. Teeth do not clog easily.

Every RED TANG File is straight and true. For they are checked again before manufacturing operation—and again the slightest packing—to guard against even the slightest packing. Always defect. RED TANG on the files you buy. Always specify Simonds.

SIMONDS SAW & STEEL CO.

FITCHBURG, MASSACHUSETTS

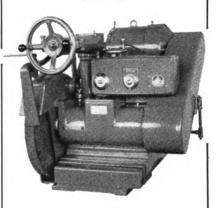
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INDEPENDENT
GRINDING WHEEL
HEAD



A self-contained unit hydraulically operated with an automatic grinding cycle—with DIMINISHING FEED.

Can be applied to most any plain grinder.

Weight 1900 lbs. Takes wheels 24"x2"x12" — 20"x 4"x12".

FITCHBURG GRINDING MACHINE CORP.

Fitchburg, Mass.

holes in each end varies for different sizes of the product and this is provided for by having the bushing through which the drill passes arranged in a slot so that adjustments are possible. This jig is a good example of heavy welded construction with true inside surfaces obtained without machining, and against which the part can be pushed for proper indexing. It would be extremely difficult, to say the least, to machine the inside if this were in one piece. Another view of this jig is shown in the illustration Fig. 4.

In Fig. 5 is shown a welding fixture of welded construction for fabricating the handle fork for a lift truck. The fork is made of several pieces of steel welded together and these are held in place in the fixture for the welding process. Of course the fork might be forged, but this would be much more expensive than welded fabrication, which is made so easy by the fixture. The fixture also insures accuracy, so that the interchangeability feature is not lost.

These examples could be multiplied at great length but the few which have been given serve to show some of the most important features provided by the employment of welding. Of course a full set of jigs and fixtures is not required for every model and size of product as many of the parts are interchangeable for several sizes, and slight variations can be handled as described in the jig for drilling the head with the adjustable bushing.

Lewis Automatic Wire Straightening and Cutting Machines Bulletin No. 2-C-37. A general description of the Lewis No. 1-C, 2-C and 7-C Automatic Wire Straightening and Cutting Machines is contained in a four-page folder now being distributed by The Lewis Machine Company, Cleveland, Ohio. Photographs of the three different types of machines are included, together with a table of specifications. Copy free.



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First of all a motor must be sturdily constructed . . . and Allis-Chalmers Motors are the sturdiest motors on the market—bar none.

But all the sturdiness of the sturdiest motor is of no avail if its vital parts are vulnerable.

Allis-Chalmers Seal-Clad Motors are invulnerable to the attacks of metallic dust, grit, oil, moisture, chemicals and other such destructive agents, one or more of which are present in every plant to a greater or lesser degree.

The windings of Allis-Chalmers Seal-Clad Motors are provided with the ultimate protection.

The wound stator of this motor receives an impregnating treatment similar to that given the conventional type of winding . . AND THEN a Moulded Bakelite Shield, of high dielectric and mechanical strength, is fitted into a machined slot in the stator frame and tightly sealed into position with a special compound. Thus the coils are protected by hard, smooth shields that are impervious to damaging agents.

For further details, write today for Leaflet No. 2182.

The Allis-Chalmers Mfg. Co. builds standard motors of every type from 1 hp. up—also motors for special application.





Modern Equipment at Work

Remington Rand Improves Parts and Reduces Costs with G-E Electric-Furnace Brazing

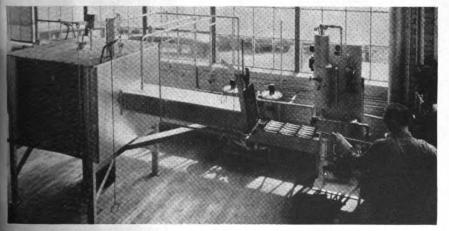
THROUGH the use of a small, G-E batch-type electric furnace for the copper-brazing in a controlled atmosphere of more than 150 different kinds of machine parts for adding and accounting machines, the Dalton-Powers Division of Remington Rand, Inc., is making substantial savings in production and service costs. The strength, quality, and life of the parts have been materially improved by the process. Four of the parts provide particularly good examples of the advantages afforded by the electric-furnace method of brazing.

When the "tubular subtraction wheel" was fabricated by riveting, it was the source of many service complaints. Now, spotted in position and electric-furnace brazed, its strength is materially increased. There are no rivets to come loose, and service costs are cut.

Formerly, the "total link arm" was stake-pinned and torch-brazed. The driving force necessary in pinning often changed the slot dimensions. Now, the part is press-fitted and electric-furnace brazed, with the result that time is saved and strength increased.

The "handle hub and driving arm" assembly was formerly held together by four riveted pins which sometimes loosened and resulted in service complaints. The parts of the assembly are now press-fitted, spotted, and electric-furnace brazed—and, as a result, rejects are entirely eliminated, service costs reduced.

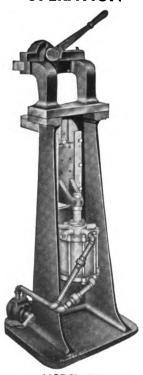
The "handle drive shaft" assembly, previously spot-welded and torch-



G-E Electric Furnace Brazing Equipment used for brazing adding machine parts. The furnace is 20 KW, 12 in. wide x 6 in. high. The heating chamber is 38 in. long and the cooling chamber is 60 in. long.

MARKING

FLAT—ROUND **IRREGULAR SURFACES** BY ROLLING **OPERATION**



MODEL 25 HI-DUTY MARKING MACHINE

This machine operates from your plant air line, and is one of numerous models built to produce fast, neat marking on metal parts. Hi-Duty marking machines may be had for practically any marking operation, and we will be glad to make recommendations upon receipt of your inquiries. Send prints or samples of parts to be marked, showing lettering and location, also state required production.

GEO. T. SCHMIDT, Inc. 1806 BELLE PLAINE AVE. CHICAGO, ILL.

brazed, is now press-fitted in position and electric-furnace brazed. The vibration and severe impacts that these parts have to withstand in everyday service sometimes worked the joints loose and made replacements neces-With the electric-furnacebrazed assembly, however, strength is greatly improved and freedom from complaint on vibration-loosened joints realized.

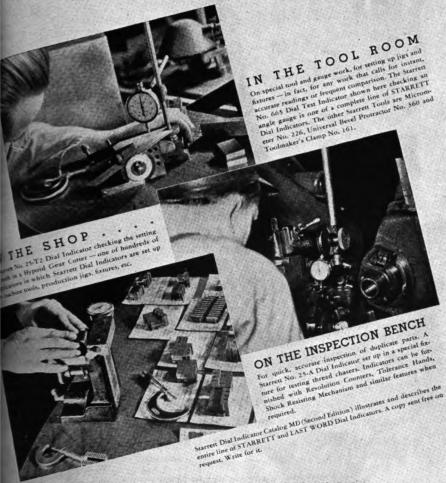
The equipment used for this work consists of a General Electric controlled - atmosphere, copper - brazing furnace and a G-E combustion-type furnace atmosphere controller. furnace, 12 inches wide and 6 inches high, has a heating chamber 38 inches long and a cooling chamber 60 inches long. It is rated at 20 kw.

Special Vise Jaws Hold Work Firmly Without Marring

TOLDING work in the ordinary type of vise is a simple matter as long as the work has parallel sides. or at least parallel points that can be gripped between the jaws, and when all the pressure necessary can be applied to keep the work in position. But when the work is of irregular shape, or if the surfaces have been polished, or if the structure of the workpiece is fragile, a simple matter immediately becomes an important problem.

The problem is usually solved, however-after a fashion. The mechanic starts a search for something from which soft jaws can be made, and usually comes back with some pieces of sheet copper or brass which, with much chiseling and hammering, he fashions into coverings for the visejaws. These copper "jaws" afford a certain amount of protection for the polished surfaces of the work, but do not go far toward solving their problem of holding the irregular pieces.

TARRETT DIAL INDICATORS FOR EVERY REQUIREMENT

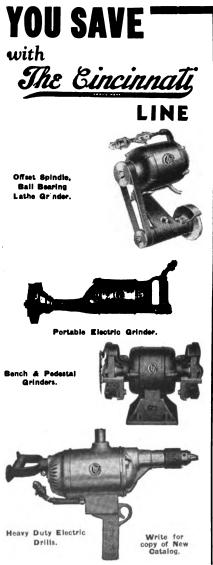


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THE CINCINNATI
ELECTRICAL TOOL COMPANY
DIVISION OF R. K. LE BLOND MACHINE
CINCINNATI

OHIO

The illustration shows a mechan working on a piece of work that held between Cornelius Q-D (qui detachable) jaws which have been a plied to an ordinary vise. The wor piece is of circular shape and the



Q-D vise jaws make it possible to hold we of any shape without danger of alipping marring.

would be difficult to hold between the steel jaws of the vise, but it is he firmly between the Q-D jaws, which are also of circular shape.

A set of Q-D jaws includes jaws of four different styles; semi-roun which are padded, for holding circular parts; V-jaws, with slots running both horizontal and perpendicula straight padded jaws for holding posished work, and bevel jaws, which have an advantage in certain instances. The jaws are easily slipped in place and are held in position to counterweights which rest on the restores of the vise-jaws.





ATKINS

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With your production costs in mind we recommend "Silver Steel"—the perfect saw steel...thus giving you strong, sharp biting teeth, longer life, and smooth, clean cutting. All Atkins Silver Steel Saws are designed to give perfect performance, and economy... Your test will be welcomed... See your distributor.

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ATKINS SILVER SAWS

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Ideas from Readers

This department is a clearing house for ideas . . . If there is a "kink" or short cut in use in your shop, send in a description of it . . . Each one published will be paid for.

Increasing the Efficiency of a Floor Grinder

By R. B. LOVELAND

THE illustration shows how the efficiency of a Black & Decker Heavy Duty Floor Grinder was practically doubled, at the Roanoke shops of the Norfolk & Western Railway,

sult, the grinder shown was fitted with extension shafts and a pair of wheels which could be dressed for radius grinding, thus providing a flat surface wheel and a radius wheel at each end of the machine.

The radius wheel spindle is a short

The radius wheel spindle is a short shaft shouldered and threaded at the outer end for wheel mounting in the

Grinding a radius in a tire forming tool. With the extra wheel, both straight surfaces and radii can be ground on the same machine.

by the addition of an extra pair of grinding wheels.

There are a number of operations in a locomotive shop—particularly the wheel turning operation—for which form tools are required, and quite a bit of time can be saved if the tool grinder can transfer his work from one wheel to another without the necessity of walking back and forth between grinders. To achieve this re-

same manner as the regular spindle. The opposite end of the shaft is bored and threaded internally to fit the thread on the end of the regular machine spindle, the outside being milled hexagon to provide for a wrench, as shown. When tightly screwed onto the spindle, the extension serves both as a spindle for the extra wheel and also as

a nut in place of the usual nut. A stud carrying a wheel guard completes the assembly. A wheel guard is easily fabricated from heavy sheet steel, cut to provide the necessary parts, and welded together.

With this equipment the tool grinder can grind a straight surface on the flat-face wheel and immediately transfer the work to the radius wheel for radius grinding.

Step Up Sawing Speeds, Feeds and Blade Tension

Don't baby your hack saw machine—get all you can out of it.

MARVEL

High - Speed - Edge

Hack Saw Blades

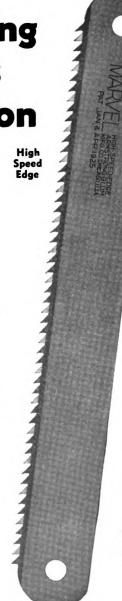
Strictly High-Speed, these patented combination blades are also **positively unbreakable**. They permit greatly increased running speeds, for heavier feed pressures, and can be tensioned much tighter than other blades because the hardened "eyes" in their tough alloy steel body will not pull out. No matter what hack saw equipment you use, you can safely run at full capacity with MARVEL High-Speed-Edge Blades.

Write for Circular

Armstrong - Blum Mfg. Co.

"The Hack Saw People"

5745 Bloomingdale Ave.
Chicago, U. S. A.



Tough Alloy Body

Second-Operation Loading Device for Automatic Screw Machines

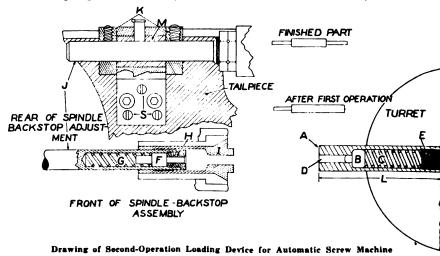
By WALTER G. PORTER

HE device shown, which was built in our own plant, has been used with great success on both No. 00 and No. 0 B & S Automatic Screw Machines. The design incorporates features which eliminate the bugbear of hand-operated single-cycle second operations on short run lots of pins and screws similar to that shown in the drawing. In using this set-up in the production of the part shown, on 10,-000 pieces a total saving of 45 per cent was made over a previous lot of the same size when the old singlecycle hand-loading method was used.

The device consists of two major parts; the loading finger A and the collet chuck I. The loading finger A is made to a diameter that will be a push fit in one of the holes in the turret. From the rear the loading finger is drilled to take the plunger, B, which is held in place by the spring C. The spring was No. 20 (B & S

gauge) wire, coiled to make a sprim 9/16 in. diameter with four coils the inch. The spring was locked i position by the threaded plug E, which was counterbored to form a seat for the spring. The hole D was reamed to a slip fit for the workpiece. The length of the loading finger, indicate at L, should be all that the set-up wipermit, in order to permit the max mum of spring length with consequer fuller movement of the plunger.

The spring collet I should be of to suit the diameter bein gripped, which, in this case, is th large diameter of the workpiece. The backstop rod, J is of 1/2-in. cold rolle steel of suitable length to project least four in. beyond the extreme res end of the spindle. The front end of the backstop rod is drilled to take th spring G and the plunger F, and i also tapped for the plug H. The com pression spring G is of No. 24 wire () & S gauge) coiled to form a spring 3 in. in diameter with five coils to th inch. The spring plunger F is a slid ing fit in the hole in which it is loca ted. The plug H should be threade with an Alemite thread, and the hol





MODERN MACHINE SHOP

127

PRODUCTION RECORDS SPEAK LOUDER THAN WORDS TO ME"

"BUT HE WAS
PLENTY TOUGH
TO CONVINCE IN
THE FIRST PLACE"



15,000,000 LOCK NUTS from THIS SET OF DIES

Blanking dies and punches of Colonial No. 7 blanked this large number of nuts from hot rolled sheet steel .20 to .30 carbon .125 to .130 thickness at the rate of 90 strokes of the press per minute. Colonial No. 7 is made-to-order for jobs like this.

Vanadium-Alloys
STEEL COMPANY
LATROBE, PA.

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through the plug should be approximately 0.015 in. larger than the small diameter on the finished end of the pin.

The thrust adjustment collars K are 1 in. diameter x ½ in. in width x ½-in. hole. Setscrews bearing against the shaft J provide adjustment both for end play and to determine the length of the stop at the front end of the spindle. The bronze bushing M is a bearing for shaft J. Shaft J is keyed to the spindle by a small steel pin which is filed to fit the keyway in the spindle.

The machine is set to load continuously, and as the turret indexes around to bring the loading finger into upright position, the operator inserts a semi-finished piece. At that instant the collet opens and the part that has just been completed is ejected. The loading finger now indexes to horizontal and advances to the collet. The

spring within the loading finger advances the part into the collet, against the backstop, and at this point the collet closes. The machining operations follow and the operation is repeated.

The lead cam should be made so as to permit movement of the turret slide up to and beyond the face of the collet. The springs in the loading finger and backstop should be made according to specifications, as the spring in the loading finger must be stronger than the spring in the backstop so as to force the blank back against the stop, against the pressure of the ejection spring G.

Flippers for Stripped Parts

BY CHAS. H. WILLEY

A LTHOUGH compressed air is pretty generally available, it sometimes happens that a press will



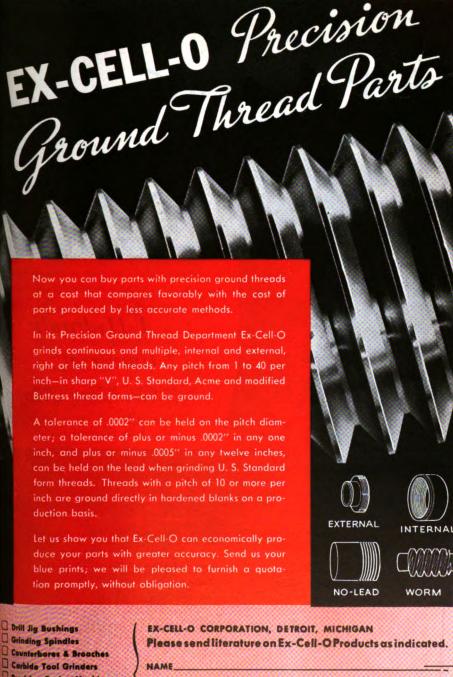
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Victor "Moly" Hack Saw Blades cut everything from chrome steels to wire rope with 100% satisfactory results. Users repeatedly and truthfully say Victor "Moly" Blades out-perform anything they have previously used even on the toughest jobs.

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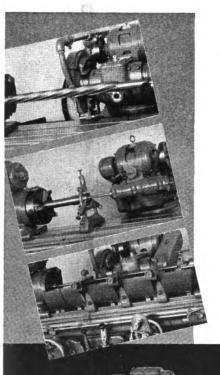


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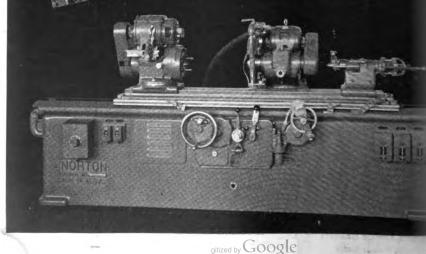
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A Hydraulic
Universal
Grinding Mach



MONG the features which contribute to the machine's versatility and its long life with maintenance of accuracy are:

> Hydraulic power work table traverse

> Motor-driven universal work head - live spindle or dead center

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> Large wheel spindle with automatically oiled bearings

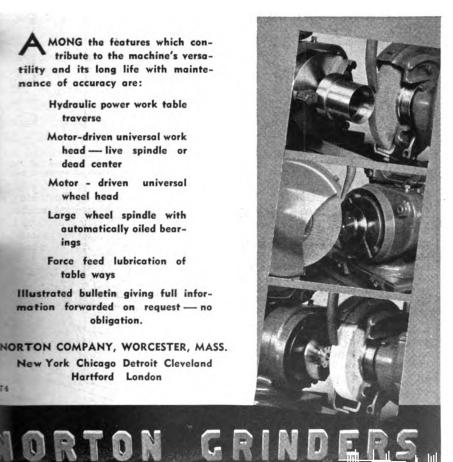
> Force feed lubrication of table ways

Illustrated bulletin giving full information forwarded on request - no obligation.

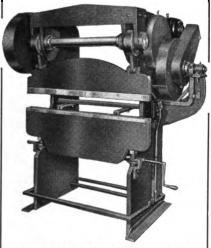
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CHICAGO STEEL PRESS No. 253



Does 40% to 60% of the forming work turned out by the average shop.

Here's a profitable, economical brake ideally adapted for rapidly forming metal sections such as in stoves, refrigerators, soda fountains, steel cabinets, metal furniture, steel boxes, and a great variety of sheet metal specialties. Its variable speed drive operates from 17 to 50 strokes per minute. The No. 253 CHICAGO STEEL PRESS is accurate, compact, and ruggedly constructed of highest quality materials.

Sizes 4, 5 and 6 ft. capacities, up to 10 gauge.

Write for Circular No. 253

DREIS & KRUMP MFG. COMPANY

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CHICAGO ILLINOIS

be located where air is not available and thus other means must be provided for clearing a die of stripper

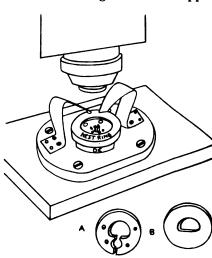


Fig. 1—Drawing illustrating design of "flip pers" for keeping die clear of stripped parts

parts. The drawings illustrate a method that has been used successfully by the writer. To illustrate the design of the tool, a workpiece A is used, but the idea can be used on

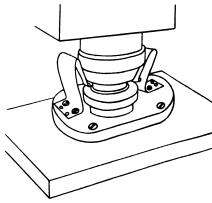


Fig. 2-As the punch descends, the flippers are spread apart.

SAVE TIME, MATERIAL, TOOLS and POWER

These four factors make up your drilling cost. Reduce any or all of them, and you'll reduce your "cost per hole"—which is the only true measure of a drill's ability.

PROVIDENCE PRECISION DRILLS are daily demonstrating their ability to effect savings on all four cost factors. While built to PRECISION standards throughout, they have also that rugged stand-upability which assures PRECISION results even under the hard drive of production work.

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Have high-grade ball bearings at every rotating point. Wear is practically eliminated—accuracy maintained — sensitive-ness increased — vibration and chatter done away with—power saved—lubrication needed only at long intervals. Write for Bulletin and prices.

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work of a variety of designs.

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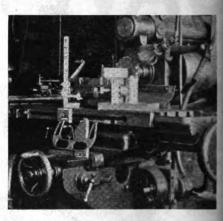
In the example shown, the workpiece is punched and divided. This part is used in the building of laminated lagnets, and is of 0.062-in, magnet steel. The feature of the tool is the pair of flippers, which can easily be identified by the reader. As the punch descends, the flippers are spread by the tapered portion of the punch as shown in Fig. 2. When the punch rises, it carries the workpiece with it until it reaches the top of the stroke at which point the workpiece is stripped off. As it drops, it falls on the ends of the flippers, which have now sprung back again to form a guard over the nest ring of the die. The flippers being slightly twisted, the workpiece is "dumped" to the rear, clear of the die.

Simple Device Promotes Accuracy in Precision Boring

BY RUSSELL G. HOWARD

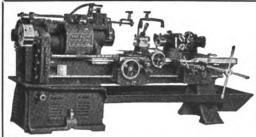
THAT every possible precaution is taken by the manufacturers of the present-day milling machines to ensure the accuracy of those machines is quite obvious. However, whether in a large shop or a small one, there will be times when a device such as the one illustrated here can be used to advantage.

The device consists of two hardened plates, each provided with screw holes by which it can be anchored to the machine table, and each having a hard-



This photograph shows the precision measuring device in place on the milling machine, together with micrometer used to take the measurements.

ened and ground pin over which measurements may be taken with the micrometer. Plate "A" has a tongue which fits into the slot in the front of the machine table and thus helps to locate and hold it. A counterbored screw hole makes it possible to secure the plate to the table by using the same screw that is used to hold the stops in position. Plate "B" is anchored to the front of the transverse slide as shown in the photo-



Cincinnati Acme Universal Turret Lathes

A powerful rigid machine for a wide range of accurate bar and chuck work.

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THE ACME MACHINE TOOL COMPANY
CINCINNATI, OHIO

A SCRAP OF PAPER WORTH MILLIONS

TO EVERY MAN WHO OWNS A PLANT OR RUNS A MACHINE:
Busy Executives...for 71 years...have found the
man who sells Gargoyle Oils offers a Proved, Practical
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How "Correct Lubrication" Saves Millions for Industry

1 Curbs power losses... saves consumption and

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3 Improves production by greater machine efficiency.

4 Lowers lubrication costs.

Today's fast-working machines must have Correct Lubrication!

Socony-Vacuum—with the greatest experience in the oil industry—is best equipped to give it to you!

See the Socony-Vacuum representative. He has Gargoyle Lubricants which are scientifically right for your machines!

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CORRECT LUBRICATION



SAVES MONEY FOR INDUSTRY

Read what 71 Years' Lubricating Experience...the Greatest in the Oil Business...can do for You. See Next Page.

Careful selection of the right kind of lubricants for all types of power and production equipment...curbing losses and waste of power generated or purchased.

2 Proper methods of application... the right oil in the right amount... aiding higher machine speeds...less spoilage or rejects... protecting investments in machinery.

THE SUM OF THESE FOUR SAVINGS

- 1. REDUCED POWER CONSUMPTION
- 2. MORE CONTINUOUS PRODUCTION
- 3. DECREASED MAINTENANCE
- 4. LOWER LUBRICATION COSTS
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Experience in dealing withindividual operating conditions...correction of out-dated practices often resulting in excessive repair and replacement costs.

A planned lubrication program ... quality lubricants where necessary ... other lubricants where use will provide economy and not handicap machine efficiency.

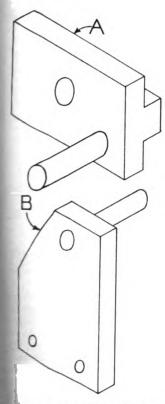
SOCONY-VACUUM OIL CO.

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raph. When the plates are properly schored, the pins are at the same light; thus it is a simple matter to easure over the pins with a micromer of the correct size. However, hen the machine table is moved, the



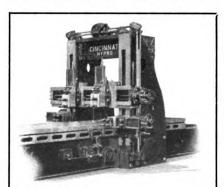
of the plates "A" and "B", comprisprecision measuring device for the milling machine.

between the pins is varied ac-

an example of the advantage of device, let us assume that we bore several holes in a jig or plate, the holes to be spaced limits of 0.001 in. The job is

equipped with the plates referred to. The first move is to square the fixed jaw of the vise with the machine-spindle, and the second is to clamp the plate in the vise in a vertical position; that is, standing on its side. The third action consists in inserting a stub arbor or plug into the machine spindle. The plug must, however, run true.

To obtain the first measurement, which is the distance from the end of the plate to the center of the hole A, the table is moved endwise to bring the end of the plate into contact with the plug. Taking the diameter of the plug into consideration, the distance from the end of the plate to the center of the spindle is easily obtained. At this point, the plate "A" is placed in position on the front of the machine table, within measuring range of plate "B", and clamped. It is now a simple matter to take the measurement across the pins and add to this amount the distance the table must be moved



PLANERS

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PLANER TYPE MILLERS
VERTICAL BORING MILLS

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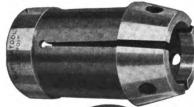
THE CINCINNATI PLANER CO.



DIAMOND SUT COLLETS N



all automatic and hand screw machines





Master-type with diamond serrated pads.

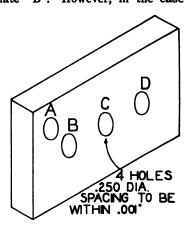


Compensating Master-type with diamond-serrated, self-adjusting pads for hot-rolled stock.

WRITE FOR COMPLETE CATALOG
SUTTON TOOL COMPANY
2838 W. Grand Blvd., Detroit, Mich.

in order to obtain the precise location of the first hole.

The vertical dimensions can be obtained in the same manner. Plate "A' is designed with the pin offset so that the plate can be reversed to bring this pin high enough to clear the pin in plate "B". However, in the case of



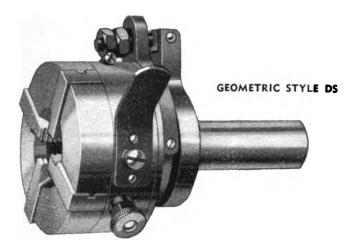
Drawing illustrating type of jig-plate whice can be precision-bered on a milling machin equipped with the device described.

the horizontal movement, should the holes B, C, and D be bored first, is would be necessary to reestablish the reading before the hole A can be bored. In this case, plate "A" is shifted to the other side of plate "B and the measurements are taken a before. The transverse screw is used to feed the work into the boring bar which is positioned in the spindle of the machine.

Unique Clock Indicates Safety Record

BY G. F. CAGLE

DIAL with an indicating han can always be depended upon to attract attention, whether the han is there to indicate the hour or wheth



Your Threading Problems -- ARE SOLVED BY GEOMETRIC

Difficult thread-cutting jobs are easier and cheaper when Self-Opening Die Heads are used. The elimination of backing-off brings higher production and more accurate threads. Replaceable Chasers and the ability of each tool to cut a wide range of diameters—means greater economy. Size adjustments for wear and grinding insures that the last thread will be as accurate as the first.

For general Light Duty threading—fine pitches on the smaller diameters, short lengths—Geometric offers the Style DS Self-Opening Die Head. Designed especially for B. & S. Automatics, suitable for hand machines as well; with sensitive trip to prevent stripping or shaving, automatic closing attachment, floating shank and buffer action—a tool that produces smooth, accurate threads to close limits, for less money.

Few products are without threaded parts somewhere and fewer still are the shops where this threading cannot be done cheaper and better by Geometric Tools. Let us send you our folder describing the Style DS Head.

The Geometric Tool Company

NEW HAVEN, CONNECTICUT

gitized by Google



This "clock", at the entrance to the Macon Shops of the Central of Georgia Railway, presents the safety record for the month.

er—as in the illustration below—it indicates the number of men who were injured at their work during the previous month.

This clock and the record-board of which it forms a part are prominently displayed at the entrance to the Macon shops of the Central of Georgia Railway. The board is mounted at the top of a smooth grass-carpeted incline upon the face of which the legend "Safety First" appears in large concrete letters.

Whenever a lost-time accident occurs, the hand on the clock is moved accordingly, the figure indicated at the end of each month being the total of such accidents for the month. This figure is then transferred to its proper square under the name of the month and the year, and the clockhand is set back to zero, ready for another month.

Niagara Power Squaring Shears, product of Niagara Machine & Tool Works, 667 Northland Ave., Buffalo, N. Y., are fully described and illustrated in an eight-page folder now being issued by this firm. Copy free upon request.



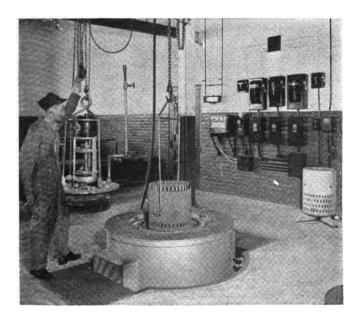
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MILWAUKEE

WISCONSIN

Over the Editor's Desk

Strikes Against Strikes

USINESS in general has held its own throughout the United States; in fact, it should have a couple of years to go yet before the crest will have been reached. And yet the building construction and housing industries have slowed down until they are practically at a standstill. An investigation among architects and builders as to the cause of this peculiar situation brings forth one answer—costs are too high. And what is responsible for this increase in costs? The demands of labor.

Labor, like anything else, is worth what the seller can get for it. An experienced merchant prices his merchandise high enough to give him a fair profit, but low enough to invite sales. He gets all he can, but he is smart enough to keep his prices low enough to be interesting. Labor, also, is entitled to all it can get, but labor is taking the stand that it can set a price and the buyers will have to pay it. A greater mistake was never made.

Merchandisers will get along without needed store and warehouse space, manufacturers will find ways to do without manufacturing room, and the public will do without new homes rather than pay exorbitant prices comprising practically a buyers' strike of those who would otherwise buy buildings.

What the worker fails to realize is that it is the public, and not the owner of the business, who dictates the amount of wages that shall be paid. He may force the employer to give him the increase demanded, but if the price of the product is too high, Mr. or Mrs. John Q. Public will decide to get along without it. And if people pass up buying enough,

we will quickly find ourselves in the midst of another depression Labor needs some lessons in merchandising.

Is Uncle Sam Embezzling?

I F a charitable organization tool
a specific fund of money and used a specific fund of money and use it for purposes other than those design nated when the money was raised what would the donors think about it If your local village or city govern ment asked you to vote bonds to rais money for a civil improvement and then used that money for something entirely different, what would you and your neighbors think about it? Ye that is exactly what is being done by our national government, according to a statement made in the House o Representatives by the Hon. Dudley A. White of Ohio.

Mr. White says "As the social security taxes come in, this cash is being dispersed by the Treasury for current expenditures and an equivalent amount of Government Bonds is deposited in the social-security reserve fund. For the fiscal year 1938 beginning July 1937, this source of funds alone will aggregate some \$700, 000,000. At the end of the year, how ever, apparently there will be nothing in the social-security reserve funds ave that amount of government I. O U.'s."

Withdrawals for social-security pensions have already begun, and, while the drain is not noticeable now, it will become heavier as the months and years pass. Where is the money coming from for these pensions? Is the government going to be able to make restitution in time, or are the tax-payers going to be forced to dig down and make up a deficit to cover funds that have been entrusted to the government for a definite purpose—but that are being used for current expenses?

SPECIAL and STANDARD TOOLS

Ьy

NATIONAL

Special Tools, as well as Tools of Standard Types and Sizes, bearing the NATIONAL name, will serve you longer and better.



New Shop Equipment

Norton 14-In. Multipurpose Hydraulic Universal Grinding Machine

Norton Company, Worcester, Mass., announces a completely redesigned model of their Multipurpose Grinder. This new universal grinding machine is now offered in 14 in. wing and in three lengths, 36 in., 48 in., and 72 in. The new machine is much heavier than previous models and has many advanced features which make it equally efficient for miscellaneous general production or for the tool room.

Among the features of the machine which add to its versatility and long life are: hydraulic power work table traverse, a universal wheel head and work head the latter being so arranged that either live spindle or dead center are instantly available, force feed lubrication of the table ways, and a wheel spindle of large proportions with each bearing individually and automatically lubricated.

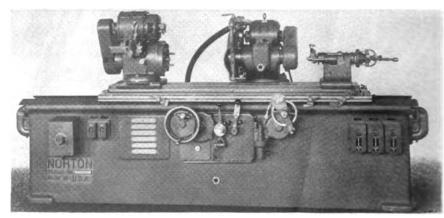
The machine is designed for direct motor drive only, a feature being that the principal mechanisms are driven each by its individual motor. Five motors are used, three of which for the hydraulic oil, lubricating oil and coolant pumps are built into the machine and are included in the regular equipment.

A flat top swivel table is used having a large tee slot its entire length. The swivel adjustment at the right end of the table comprises a screw and nut arrangement providing close adjustment. Scales are graduated to indicate taper in inches per foot, millimeters per 100 mm and degree of angle.

The universal headstock is mounted on a swivel base clamped to the table by two bolts in a manner that prevents distortion. The headstock may be turned through the entire 360 deg. and clamped in any desired position. The drive is through vee belts from an adjustable speed motor mounted on the headstock. The spindle and drive plate revolve on large ball bearings and either live spindle or dead center operation is instantly available.

Stopping and starting is controlled by a convenient lever operating a contype clutch and friction brake so that it is not necessary to stop and start it motor. A clear hole through the spindlermits the use of a draw rod for draw-in collet, a knock-out bar, or for a water pipe for wet internal grinding

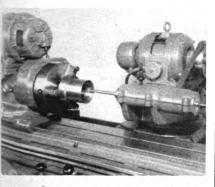
a water pipe for wet internal grinding. Work table traverse is either by hand wheel or hydraulic power. Hydraulic traverse is by means of a cylinder attached to the under side of the table and two pistons the rods of which are attached one to each end of the base



Norton 14-In. Multipurpose Hydraulic Universal Grinding Machine gitized by Google

casting. Oil is delivered from a tank in the base through a reversing valve and through the piston rods which are hollow to the cylinder. This method provides smooth and powerful table movement with the operating piston rod always in tension. When hydraulic traverse is used the hand wheel is automatically disengaged. Traverse speeds up to 144 in. per minute are available.

The universal grinding wheel head rests on a swivel base and compound slide. The wheels for either external



Norton Multipurpose Grinder Set Up for Internal Grinding.

or internal grinding may be set at any desired angle with the work. The external and internal grinding wheel spindles are mounted on opposite sides of the wheel head and are driven independently by a motor mounted on the wheel head and having a double shaft extension. Direct belt drive to each spindle from the motor requires no idlers nor intermediate shafts.

A hand operated grinding wheel feed indexes to 0.0001-in., and also provides for rapid movement when locating with respect to the work. The wheel feed control is conveniently located on the front of the machine and is operated from this position regardless of the setting of the wheel slide. The feed may be in the normal direction perpendicular to the table ways or in any angular direction for which the wheel head is set.

The 48-in. machine here illustrated weighs about 8000 lbs., mounts wheels up to 14x1½ in. for cylindrical grinding or cup type wheels 12x3 in. for face grinding, and will swing work 14-15/16 in. over the table top. A 5 hp. motor is required for the wheel drive and ½ hp. for the work drive.

Do Two Men's Work

One Man's Time

Experience has proved that it does not pay to utilize man power in handling loads of 500 pounds or less. . The Lo-Hed Quarter-Ton Hoist — the original electric hoist of its capacity— was built specifically for loads too heavy for two men to handle safely, profitably . . The new Lo-Hed catalog shows you its 21 features, tells about the 96 other standard Lo-Hed Hoists. Send for a copy.

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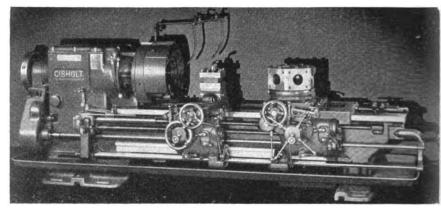
Philadelphia, Pa.



Other Products: A-E-CO Taylor Stokers, A-E-CO Hele-Shaw Pumps, Motors and Transmissions, A-E-CO Marine and Yacht Auxiliaries.

Gentlement Lo-Hed contains and easily and quirement	n: Please send me your complete nev atalog including an outline of how to d properly select a hoist for any re 	7)
Name of	Company	
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Improved Gisholt No. 4L Heavy Duty Turret Lathe

Improved Gisholt Heavy Duty Turret Lathes

Gisholt 3AL, 4L and 5L Heavy Duty Turret Lathes, made by Gisholt Machine Company, 1217 E. Washington Ave., Madison, Wis., have many new features which increase production, make operation easier and faster, and improve the quality of work. The lathes are built in three sizes ranging from 6 in. to 12 in. bar capacity and 21 in. to 32 in. chucking capacity, and are identical in design, differing only in size and capacity. They are intended for both large quantity production of similar pieces or small lot jobbing of irregular and varied types of work. The machines are available with complete attachments, standard tools, chucks, boring bars, reamers and special tools and holding devices ready to go into production.

In the construction, the bed and headstock of these machines is cast in one piece from nickel semi-steel, this bed casting weighing nearly half the total weight of the finished machine. The bed ways are of steel, hardened and ground in place which provides a bearing that has proven to be most satisfactory in eliminating wear and in preserving the original accuracy of the machine.

The new 12 speed transmission is of the sliding gear construction and has a normal speed range of 12 r.p.m to 220 r.p.m for the 3AL and 8 to 142 r.p.m. on the 4L and 5L. Speeds are arranged in geometric progression for the varying diameters of work. The spindle is mounted on twin tapered roller bearings at the front and a straight roller bear-

ing at the rear. An automatic multiple disc spindle brake stops the spindle quickly when the clutch lever is placed in neutral position. All gear shafts and bearings run in an oil bath and the spindle bearings are continually fed with clean oil from a catch reservoir. Perfect lubrication is assured with a minimum of attention.

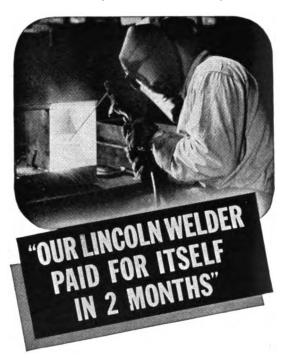
Feeds and rapid traverse are controlled at each carriage entirely independent of each other. The eight reversible feeds are selected at the aprons and range in arithmetical progression from 0.008 to 0.250 in. With the change gears provided, this range may be varied from a fine range of 0.004 to 0.125 in. to a coarse range of 0.016 to 0.500 in. providing a total of 64 available feeds. Feeding is accomplished through separate accurately cut lead screws for each carriage and the feeds provided permit the cutting of all U. S. standard threads from to 32 including 11½. Special change gears may be provided for special threads.

Power rapid traverse is provided for the longitudinal movement of both carriages. The rapid traverse is independent for each carriage and may be used without disengaging the feed. An electrically operated power rapid traverse may be supplied for the cross slide or the compound slide which, on some types of work, greatly assists the operator and materially increases the day's production. Multiple vee belt motor drive is standard with the motor mounted on the headstock, the motor being 15 to 25 h. p. for the 3AL and 25 to 40 h. p. for the 4L and 5L, depending upon the speed of operation or the type of work

The broad turret mounting affords ex-

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"Our little Lincoln is kept busy every hour of the day -building special machine parts that were formerly cast -building our own jigs and fixtures-repairing broken gears, bases, headstocks, pulleys, etc .- hard-facing our tools and dies. Its book savings alone amount to \$100 to \$300 monthly and they're increasing daily as we discover new uses for it. We wrote it off the books in two months' time." This statement, made by the manager of a Chicago machine shop is typical of those we



hear on all sides. You too will find this handy, powerful Lincoln Electric Welder a boon to savings because of its versatility.

Lincoln's large quantity production brings you this welder at the lowest price set for this type of welding equipment. Easy terms can be arranged. Mail the coupon for details.



ceptionally rigid support to the hexagon turret, which is clamped by closing a double bevel clamp ring actuated by a powerful eccentric toggle. Each face of the turret is located by a tapered pin which seats in tapered index bushrings. All parts of the locking and locating mechanism subject to wear are made of hardened steel to insure accuracy.

Machines are available with either fixed center hexagon turrets or cross feeding turrets. The fixed center turret is usually furnished for work produced in comparatively large quantities where multiple tooling, piloted supports and, in many cases, special tools are used. Cross feeding turrets are used for work involving small lots of a wide variety of shapes and sizes as well as many classes of large production work. The cross feeding turret permits of facing as well as turning and boring cuts with the hexagon turret.

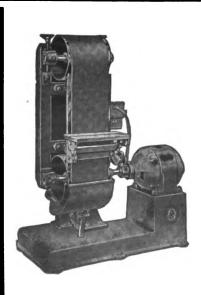
Thorough lubrication is insured to all important bearings by effective automatic methods. The headstock runs in an oil bath as do the gears in each apron. The rapid traverse clutches and gears also run in a continuous oil bath. The hardened steel ways are lubricated by means of force feed pumps attached to each carriage. Each movement of the

rapid traverse lever delivers oil under pressure to each way under the carriages.

Extra attachments are available that admirably adapt these machines to individual manufacturers' requirements. These include a compound slide carrying the square turret; bar feed; either power or hand operated; collet chucks for 3ALs; turret centers for heavy work where outer support is required; selective gear box in place of pick off gears for varying the speed of the speed shaft; taper attachments for both the cross slide carriage or the hexagon turret carriage, Gisholt 3 jaw scroll chucks; 4 jaw independent chucks; 4 jaw combination chucks and hydraulic chucks; and an extensive line of standard tool equipment for chucking work and bar work.

J and L Automatic Thread Grinding Machine

The Jones & Lampson Machine Company, Springfield, Vt., announces an automatic thread grinding machine designed to grind threads on work up to 8 in. in diameter when using a 20-in. grinding wheel. Work 40 in. long is accommodated between centers and 18 in. of thread may be ground anywhere on



ELIMINATE

COSTLY HAND SAWING & FILING with a

PEERLESS SURFACING MACHINE

With a Peerless Surfacer, you not only eliminate costly hand sawing and filing but often save the cost of an expensive milling machine or planer operation.

Peerless Surfacers give a high quality, straight line finish to metal, rubber, fibre compesition. wood, etc.

The advantages of a straight-grained finish and the economies of time and material warrant careful consideration.

Vertical or horizontal machines available in 4" to 20" sizes.

Write for details.

PRODUCTION MACHINE CO. GREENFIELD,

JOHNSON QUALITY BRONZE

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ELECTRIC M O T O R



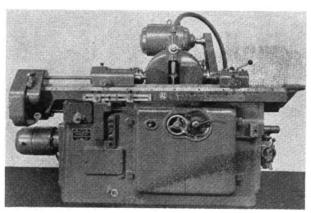
Performance

● Smooth, quiet performance—long bearing life is yours when you install Johnson Electric Motor Bearings. Correct in design, alloy and tolerance, they slip right into the housing and over the shaft with little or no additional work. In every case they are equal to or better than original equipment. Write today for a copy of our new catalogue—fully illustrated and listing over 200 individual bearings covering practically every make of motor. There is no obligation.

JOHNSON BRONZE

590 S. MILL STREET · NEW CASTLE, PA.

leeve Bearing Headquarters



J & L Automatic Thread Grinding Machine

36 in. of work length. The swing over the work slide is 11½ in., and 11½ in. diameter threads may be ground when the wheel is 16½-in. diameter or smaller. A 20-in. wheel is furnished as standard and, as wheel decreases in size, proper peripheral speed may be retained through rheostat control of the wheel motor.

The helix angle capacity of the ma-

chine has been increased to include 25 deg. right hand and 30 deg. left hand.

The helix angle is controlled by means of a worm and gear.

The machine will grind single, double, triple, quadruple and sextuple threads, either right or left hand. Standard equipment includes change gears for pitches from 2 to 48 inclusive. Using a simple hardened and ground former, taper. combination of straight and taper or double taper

threads may be ground. No adjustment of thread form required when changing from straight to taper threads, and the J. & L. method of grinding taper threads makes lead compensations unnecessary.

With the necessary attachments, the mathine will grind button-type hobe and circular chasers without lead. It will back off or relieve straight or taper hose

-NEW

U. S. No. 1 Anti-Friction Bearing

Hand Milling Machine

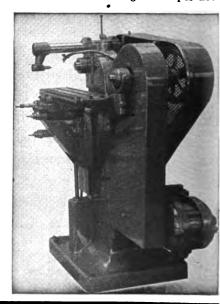
The New U. S. Hand Miller is particularly adapted to high speed light milling operations. Vertical and horizontal feeds.

Improvements: Heat treated chrome nickel steel spindle, Timken bearings, Ballbearing countershaft, V-belt drives, 6 Spindle Speeds up to 1592 R.P.M., providing efficient use of small end mills.

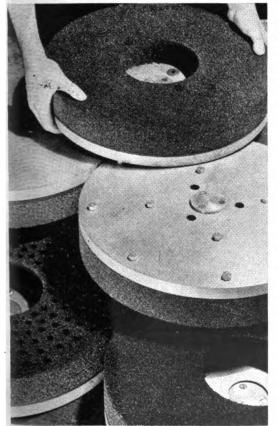
Write for full details.

The UNITED STATES MACHINE TOOL Co.

1954 W. 6th St. Cincinnati, Ohio



THE DISC WHEELS THAT CAUSED A REVOLUTION!



DISC WHEELS BY CARBORUNDUM have revolutionized the whole process of disc grinding. First, because they're not merely discs—they're mounted grinding wheels. Second, because they come in a range of grits impossible with the ordinary paper or cloth disc.

INCREASED PRODUCTION..BETTER FINISHES. A wide selection of grits means you get the right wheel for every job. This results in better finished pieces... increased production.

WHEEL BOLTS DIRECTLY TO PLATE. A specially designed nut and bolt system holds the abrasive wheel to the face plate. Thus, you have a better balanced disc. Replacement is easy. There's no gluing or pressing. These new disc wheels are made in every practical shape and size. They are available both in Carborundum Brand Silicon Carbide and Aloxite Brand Aluminum Oxide...you can get the right wheel to grind any metal, soft or hard. We'll be glad to give you more detailed information on request.

CARBORUNDUM ABRASIVE PRODUCTS

Illustration at left shows group of Carborundum Brand Silicon Carbide and Alaxite Brand Aluminum Oxide Disc Grinding Wheels. Note specially designed nut and bolt system for holding abrasive wheel to plate.

THE CARBORUNDUM COMPANY . NIAGARA FALLS, N.Y.

Sales Offices and Warehouses in New York, Chicago, Boston, Philadelphia, Cleveland, Detroit, Cincinnati, Pittsburgh, Grand Rapids
(Gerbarundum and Alouite are registered trade-marks of The Carbarundum Company)



or taps with either straight or spiral flutes.

A direct current motor is recommended for driving the wheel, provision being made for running all types of grinding wheels at the most efficient work speeds. An indicator shows the number of surface feet the wheel is running, based on wheel diameter r. p. m., and a graduated rheostat with pointer indicates the r. p. m. wheel is reduced diameter, the speed is maintained by simply turning the dial on the rheostat. Either A. C. or D. C. motors can be furnished for the wheel trueing device. coolant pump and for operating the machine. The self-trueing, self-sizing mechanism of the machine brings thread grinding into the range of practical shop operations. It is suited equally well to tool room and production work.

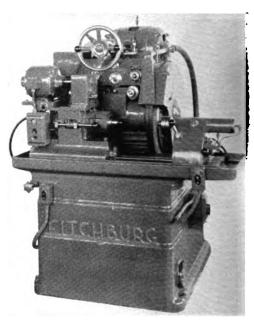
Fitchburg Plain 6x12-In. Cylindrical Grinder

The illustration shows a 6x12-in. Cylindrical Grinder which has been placed on the market by Fitchburg Grinding Machine Corporation, Fitchburg, Mass. The

machine was designed to do plunge-cut grinding only. The table is stationary,

the wheel reciprocating.

The machine is built around a Fitchburg standard "Bowgage" Wheel Head Unit, which has a completely automatic cycle and dial controlled from the panel. Headstocks can be furnished for either live or dead spindle operation, and the complete cycle can be interlocked so as to operate from one lever. It can also be equipped was a retractable headstock center and solid footstock, which has



Fitchburg Plain 6x12-In. Cylindrical Grinder

some advantages for certain classes of work.

The grinding wheel is carried on the right hand side of the spindle instead of the conventional left side; thus the wheel spindle space is consolidated with the headstock longitudinally, saving floor space, yet the machine has the weight and wheel diameter to handle comparatively large work.

The machine is also built in a chucking grinder model. The work head can be swiveled to a suitable angle for taper

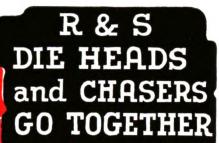
. . for more than 1001 odd jobs



The Hjorth Bench Lathe has the speed, accuracy, handling ease, and dependability that appeals to every operator. That's why you'll find the equipping with the Hjorth Lathe.

Write today for data and prices.

HJORTH LATHE & TOOL CO., 12 BEACON ST., WOBURN, MASS.



You know R & S Die Heads—we want you to know R & S Chasers too! Only Hobbed Chasers are accurate enough for fine threading—R & S Chasers are hobbed—hardened and ground to % of 1000th inch. Special steel to suit special work. 40 years of experience is at your disposal. Tell us about your toughest threading job. R & S Chasers are made for a long life of accurate cuts.

JUST LIKE YOUR LEFT and RIGHT HANDS

R&S Model F Die Head opens by pull-off method. A 1/4 turn closes the head to outting position. Use Model F on turret or hand screw machines — or for any operation where the work revolves and the head is stationary. Write for data on all styles of R&S Die Heads.

The RICKERT ERIE,

Adjustable Bring Brade Coll psible Taps

SHAFER Co.

PENNA.

Tapping Machines Automatic Cut-off Machines

work. Truing devices may be furnished for semi-automatic operation; either hand truing or the wheel hood mounted type may be used, depending upon the work to be done.

154

The maximum length between centers is 12 in., and the maximum swing over the table is 14 in. Height from floor to centers, 42 in. Number of work speeds, infinite from 50 to 350 r.p.m. Diameter of grinding wheel spindle, 3 in. Maximum feed of wheelhead on diameter, 0.125 in. Rapid traverse may be set at from 0 to 5 in. Range of grinding feed rates, infinite. Wheel sizes

NO MORE ACCIDENTS

because the Red-E Belt stick cannot catch. It PREVENTS

cannot caten. It PREVENTS belt shifting accidents. Two tapered rollers slide the belt onto the pulley easily and quickly.

Write for catalog and prices.

THE READY TOOL CO.

available, 24x2x12 in. Maximum widt 20x4x12 in. Spindle drive motor f 2-in. face wheel, 5 h.p., 1500-1800 r.p.i Headstock motor, ½ to ¼ h. p., 150 1800 r.p.m. Floor space required, 36x in. Weight, net, 4800 pounds.

I.M.C. Lester Designed Injection Molding Machine Type LPM-2

Announcement is made of a new I jection Molding Machine by the Ind Machinery Corporation of Cincinna Ohio who are sole distributors for in the United States and Canada. Ful automatic and ruggedly constructe this new I. M. C. Lester-Designed Injetion Molding Machine meets the requirements for the injection of larger a ticles with a maximum weight of ounces per casting.

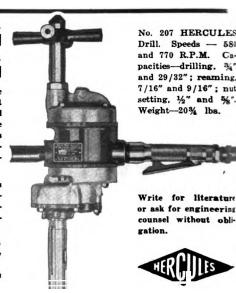
The machine operates either automatically or semi-automatically. For the semi-automatic operation of the machine, a single operating lever is provided; this lever is conveniently located insure operating efficiency. The full automatic operations of the machine.

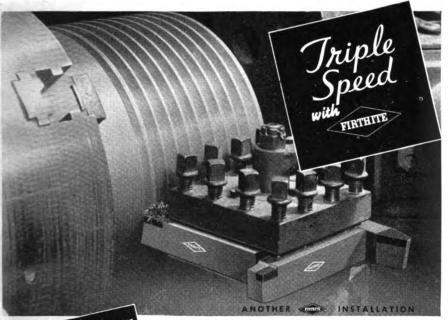
for DRILLING = and REAMING

A splendid heavy duty general purpose pneumatic drill, reamer, stud and nut setter. Screw feed—safety throttle—dead handle—Morse Taper Socket—with Spade Handle and Jacobs Chuck optional. Surplus power and high torque. Popular in automobile assembly plants, car shops, structural steel and general metal work.

Also a complete line of Grinders—Sanders
—Drills—Nut Runners—Polishers—Screwdrivers in both Pneumatic and High Frequency Electric types . . . Offices in principal industrial cities.

THE BUCKEYE Portable Tool Co.





FIRTH-STERLING PRODUCTS Firthite Sintered Carbide Tools. Firthite Sintered Carbide Stanks Firthite Sintered Carbide Stanks Firthiday Write Drawing and Extravion Dies Firthiday Write Drawing and Stanks Firthiday Write Dies Stank Firthiday Write Dies Stank Formaran Frish Stank Firth Winged Ingel Stank Firth Starling Stanks Firth Winged Ingel Stank Firth Starling Special Tool Stank Firth-Starling Special Tool Stank Tool and Die Stanks for Every Purpose

TURNING AND GROOVING SHEAVES FOR MULTIPLE V-BELT DRIVES

Four FIRTHITE tipped turning and grooving tools are roughing and finishing a 14-inch diameter semi-steel sheave at a cutting speed of 150 feet per minute. The maximum cutting speed with high speed steel tools previously used was 50 feet per minute.

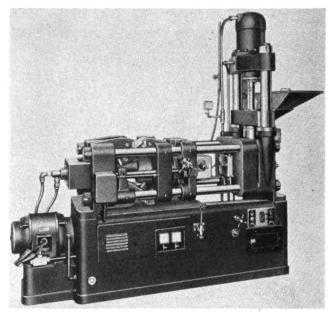
From every angle and on almost any machining application FIRTHITE tools make real savings, because of this ability to cut materials at higher speeds without deformation, or loss of hardness.

The smoother more accurate finish, longer tool life and reduction in machining time result in savings that deserve the attention of production executives.

Write for new FIRTHITE price list.



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NEW YORK CHICAGO
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CLEVELAND DAYTON
GLOBE WIRE DIVISION
MCKEESPORT, PA



1. M. C. Lester-Designed Injection Molding Machine LPM-2

are controlled by two electric clocks; all controls are arranged within easy reach of the operator and a change of position is unnecessary for complete control of the machine.

The molds are closed by hydraulic power, operating toggle joints, and these joints are firmly locked by tapered surfaces when the mold is closed, which action removes all strain from the toggle pins and insures rigid locking of the molds during injection. As a result of this construction this machine is capa-

ble of holding the molds closed for the injection of an area of 40 square inches.

Another new feature of this equipment is the adjustment of the mold on the tie bars. This is accomplished thru the use of a worm and worm wheel by which the die plates are advanced uniformly. thereby insuring absolute parallelof the die plates on the tie bars at all times. The tie bars are 3¼ in. in diameter.

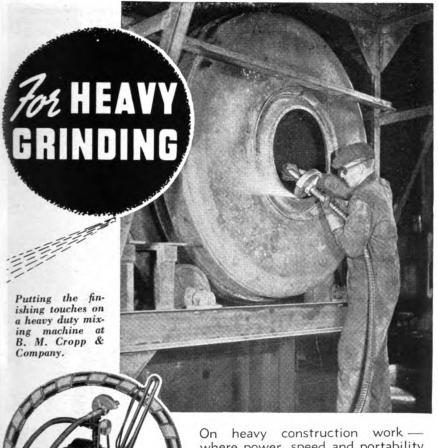
The entire heating cylinder is chromium plated and is ingeniously constructed in that all adjustments can be readily made in view of the fact that the entire heating cylinder assembly swings away from the machine

from the machine, affording exceptionally easy accessibility for adjutments. The injection stroke of 8½ in. is accomplished in 3 seconds. The base of the machine serves as an oil reservoir.

This machine is a completely self-contained unit, ready for operation as soon as the 10 h.p. motor is installed, and no other auxiliary equipment is required.

Bulletin containing complete specifications is available by addressing Index Machinery Corporation as above.





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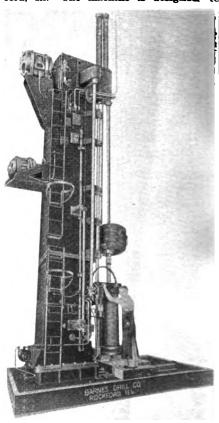
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Barnes No. 4030 Vertical Honing Machine

What is probably the largest vertical honing machine ever designed has been brought out by Barnes Drill Co., Rockford, Ill. The machine is designed to



Barnes No. 4030 Vertical Honing Machine

handle hones up to 30-in. diameter and as shown in the photograph has 90 in. of vertical spindle travel. The job illustrated is that of honing a Diesel engine sleeve having 17½-in. diameter bore by 5-ft. length. The operation is said to be smooth and uniform, with no shock at either end of the stroke. The head reciprocates on ball bearings, running on flat tracks in the hardened vertical bars.

The large aluminum reciprocating head which carries the big bronze driv-

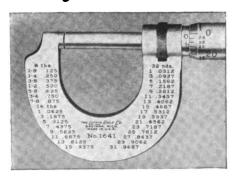
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ing gear together with the spindle and hydraulic pistons are supported on the air counterbalance shown with the vertical rods at the top of the machine. No air is wasted, as on the down stroke the limited amount of air in the cylinder is pushed back into the main line.

The eight speed changes are controlled from lever at the operator's position. There are three levers, one controlling the back gears and the other two each shifting two speeds as on the standard transmissions, the shifter forks being operated by means of chain drives from the telescopic tubing and shaft inside thereof. The upper motor in this case is 30 h.p. for 17½ to 21-in. diameter cylinders, but a larger motor will be used for larger work. The lower motor is 15 h.p. for driving the Vickers hydraulic pump system. A small motor at the bottom of the column provides a generous flow of coolant. Reservoirs in the base have more than 100 gal. capacity.

Height of the regular machine to extreme top with spindle up, 31 ft. 4 in. Distance, center of spindle to face of column, 20 in. Maximum distance from top of table to nose of flange spindle, 204 in. Floor space required, 172x86 in. Size of oil-operated work table, working

surface, 40x60 in. Horizontal travel oil-operated table, in and out on track 50 in. Spindle speeds provided, 12, 12, 30, 39, 54, 72 and 98 r.p.m. N weight with hydraulic pump, motor starters and filter, 34,700 pounds.

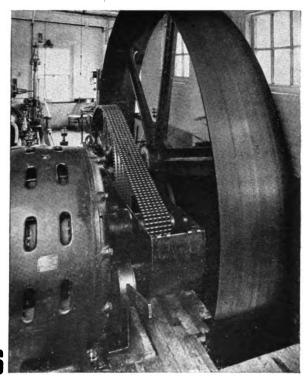
Newton Unit Head Box Type Milling Machine

A new line of milling machines whipermit converting single purpose medians into machines for future we has recently been developed by the Netton Division of Consolidated Machines Tool Corporation, Rochester, N. Y. Trype has been designated by the make as a unit Head Box Type Milling Medine, and that the naming is correctant be readily noted from the photograph of a typical machine in this life.

As can be seen, the machine is actally made up of several individual ming units on a planer type milling m chine base. The machine illustrated of extreme rigidity. It has two horizontal head units, two vertical units plan auxiliary vertical spindle for cleaning out the cut between two large vertice cutters. Later on should this machine.



(Photo courtesy Swansea Print Works. Illustration shows upper half oilproof casing removed.)



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The Baldwin-Duckworth Chain drive shown here hooks a steam engine with a generator and gives a speed *increase* of 7.05 to 1. This is an unusual lrive problem, but typical of the many successful ways in which roller chain may be used.

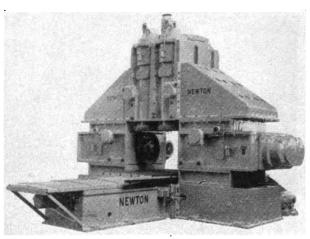
Chain speed is 1310 F.P.M. and the drive transmits up to 200 H.P.

Baldwin-Duckworth precision machining and selective heat treatment produce a roller chain that will efficiently and economically handle any power transmission or elevating problem.

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Mass.





Newton Unit Head Box Type Milling Machine

be required for work necessitating, say four horizontal spindles, the machine can be easily arranged for this operation by transposing the independently-driven vertical heads and substituting a fill-in piece at the top to complete the girt. This is not the onl change possible, how ever, as the un heads can be reset for use in any position-horizontal, vertical, of at any angle. The type construction also permits rearrangment of blocks and unit heads to accomplish the particular milling job necessar

fulness of millir machines built for specific jobs because it means that muchines do not have be discarded as product or design change eliminate the need that particular operation. With this

This development has increased the use

new unit head box type constrution, as the job changes all that is neessary is to rearrange heads and block and set them in position in accordanwith new work to be performed.

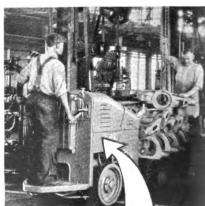
The machine illustrated is arrange

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to mill top, bottom, sides and ends of tractor transmission cases in two opera-

Spindle heads are individual units, each head having its own motor mounted directly on the head and direct gear connected by silent pinion through suitable reduction gears including pick-off gears which can be transposed or changed for varying cutting speeds. Machines can be furnished with quick change gears and also with D.C. adjustable speed motor drive. Each spindle has separate end adjustment and provision for locking spindle quills. In addition all heads can be repositioned along the holding flanges as they are drilled with closely spaced bolt holes to allow for setting up in small increments closer or farther away from work. Wide faced flame hardened herringbone spindle gears are used.

Table is of planer type construction with self-aligning V-shaped ways. It has planed top surface and is provided with parallel T-slots. Pressure lubrication is provided and oil filter is also furnished.

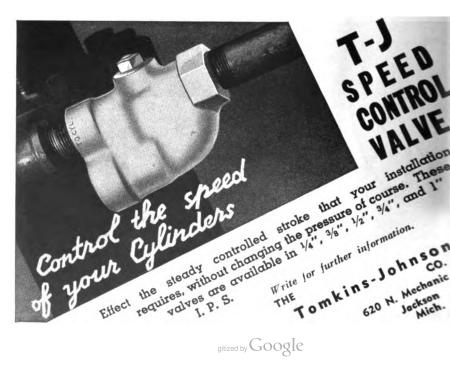
Feed drive to table is by hydraulic pressure and is controlled by single lever at operating position. This hand control of feed and rapid traverse is supplementary to automatic control regulate by adjustable trip dogs on side of talk Machines may be provided with hydron lic screw or cylinder feed or mechan screw feed.

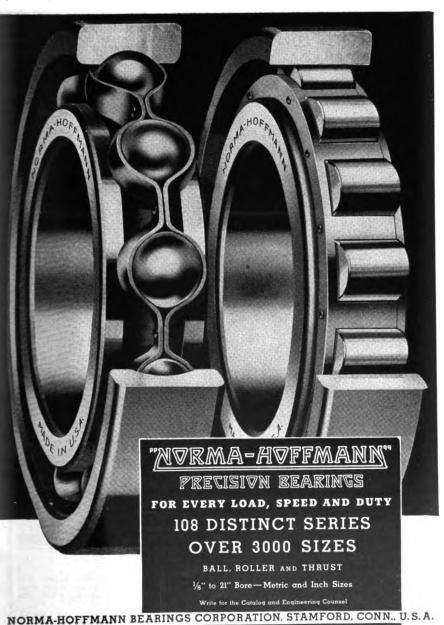
Lubrication of each head is independent, filtered oil being supplied unit pressure and the operation read checked by visible oil flow gauges.

A feature that adds to convenient and ease of operation is the device: handling the changing of the heavy eters used. This consists of a joint arm attached to rear of machine when can be swung into position for attack ing or removing cutters.

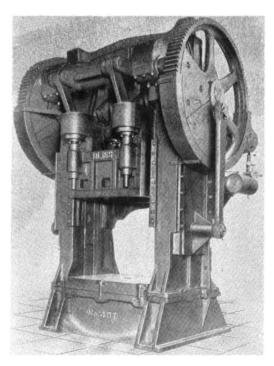
"Bliss" No. 407 Toggle Drawing Press

While it is true that the single-action press with built-in drawing cushions t do double action work has become in creasingly popular, there is a very defi nite limit to the range of work which can be accomplished with this type of equipment. In other words, the use o high blank-holding pressures, particu larly with deep draws, involves a decided increase in the capacity of the





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Bliss No. 407 Toggle Drawing Press

driving train on the press, including motor and flywheel.

The toggle double-action press, illustrated herewith, has advantages in positive gripping for stretching jobs with draw beads and in power economy on deep draws. It can draw a shell 10 inches in depth, giving maximum efficiency in the process. Then it also can

be converted from a doubleaction into a triple-action press by the addition of Marquette drawing cushions in the bed.

The Bliss No. 407 double-crank, double-action, straight-sided, toggle drawing pressillustrated is a long-stroke model. Its frame is made of four separate castings held together by extra-heavy steel tierods which are shrunk in. A 35 h.p. electric motor drives the flywheel through V-beits, which in turn drive the double-geared twin-drive train of gears.

The control is completely electric, with push buttons to start, stop or inch the press. The ability to inch is an invaluable asset in die setting. The clutch is a new Bliss full automatic, air-operated, combined friction clutch and brake with the clutch mounted in the flywheel. The flywheel is mounted on Timken roller bearings.

Some of the more important dimensions are as follows: diameter of chankshaft at bearings, 7 in.; at pins, 8 in.; plunger stroke, 21 in.; blankholder stroke, 14 in.; shut height bed to blank-holder, stroke down adjustment up, 34 in.; bolster, 6 in. thick.

The crankshaft and the intermediate shaft have renewable bronze bushings while the driveshaft is mounted on renewable Timken roller bearings. The bed is completely arranged for the addition of air cushions should it become necessary. The feature saves a great deal of time and money in installing cushions.

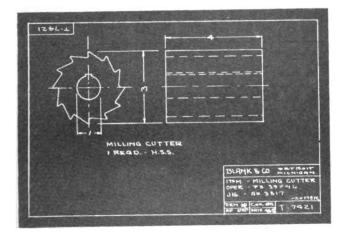


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Sundstrand Tool Grinder

For the accurate, fast, and economical grinding of cemented carbides and other cutting tools, the Sundstrand Ma-chine Tool Co., 2529 Eleventh St., Rockford, Ill., has brought out the tool grinder illustrated herewith. The Sundstrand Tool Grinder is intended to meet modern requirements by providing means for establishing accurate angles quickly for producing smooth, keen cutting edges, for free cutting, clean grinding. and for sensitive control of the opera-



Sundstrand Tool Grinder

tion. The machine is rigid, compact, and powerful.

The machine is constructed on a heavy box section pedestal with large base which provides rigid support for wheel spindles and work tables at a convenient height. Motor drive is completely ent height. Motor drive is completely enclosed. Two independent heavy spindles of heat treated chrome nickel steel are mounted on the same center line and run in precision anti-friction bearprotected by special oil seals. V-belts provide a smooth flow of power from the motor to the spindles and dampen vibration. The motor is started. stopped and reversed through a conveniently located switch. The reversing feature enables the operator to do all grinding with the wheel running toward the We have a large and diversified ine of standard burs carried in tock for quick delivery. Often our finishing problem can be olved easily with one of these. If not we can develop special was for your job. Send for our copy of our catalog showing over 300 standard burs. It is free to any interested xecutive. Write to Pratt & Vienney, Division Niles-Coment-Pond Co., Hartford, Conn.



Executives often fail to realize the many jobs these small, inexpensive, handy tools will do. A bur (or rotary file) can be shaped to do a particular job and reach that difficult place. Often a bur driven by a flexible shaft will do work that otherwise would be impossible or highly expensive. Burs do a better job than hand files, with a fraction of the effort.

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cutting edge of either right hand or left hand tools, thus increasing smoothness and durability of the edges.

A grain wheel is provided for rough grinding and a diamond-faced wheel for finishing. The rough grinding wheel has a steel back and is mounted on a spindle pilot. The steel guard is adjustable to provide for 2¾-in. wheel wear. A three-way valve and double nozzle floods either side of the grinding wheel with coolant as required. The rough grinding table has trunnions in well protected bearings to allow adjustment from 10 deg. above horizontal to 30 deg. below. The position of the table is indicated clearly on

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a direct reading scale and the table is clamped solidly by one simple move-The carriage supporting the ment. rough grinding table forms a catch basin for coolant and abrasive; it is mounted for oscillation and infeed on a heavy steel bar solidly secured in the machine Grinding is accomplished by oscillating the carriage, table and tool as a unit. Conveniently placed handles at opposite ends of the rough grinding carriage enable the operator to sweep tools completely across the face of the cup-shaped grinding wheel. A capstan nut and accurate screw feed provide delicate control of grinding pressure and the amount of metal removed. A quickacting clamp on the underside locks the rough grinding carriage in horizontal position for top rake grinding.

The diamond-faced finishing wheel is mounted on a spindle pilot fully protected by a steel guard that is adjustable for right hand or left hand grinding. The finishing table is hardened and ground. A conveniently located clamp locks the table securely in any position from 10 deg, above horizontal to 30 deg. below horizontal. The carriage supports the finishing table in well protected trunnion bearings and forms a catch basin for coolant. It is mounted on a

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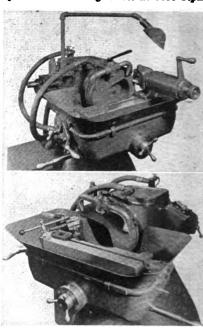
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heavy steel shaft rigidly supported in the machine column. An adjustable lame bracket and reflector provide means for focusing ample illumination upon tools. The machine is available in two mod-

The machine is available in two models: Model A, with rough grinding whee operating at 950 r.p.m. and finishin wheel at 3600 r.p.m., and Model B with rough grinding wheel running at 210 r.p.m. and finishing wheel at 3600 r.p.m.



(Above) Top rake fixture. With the fixture set up as shown and a tool clamped in pection, the operator turns the feed screw until the tool touches the grinding wheel. He thes oscillates the lever, sweeping the tool across the face of the wheel. (Below) Drill sharpening fixture. This fixture will sharpen twist drills and countersinks up to ½-in. diameter.

The height of the spindle above the floor is 40½ in. and the dimensions of the base are 25x26½ in. Floor space required, 41x37 in. Weight, including motor, 1090 pounds.

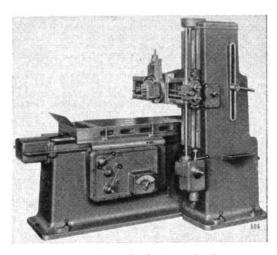
Extra equipment includes a 1½ h.p., 1800 r.p.m. or 1500 r.p.m. motor, 10-in diameter grain wheel for roughing, 6-in diameter diamond-faced wheel for finishing, top rake fixture, clearance angle fixture, finishing protractor, drill sharpening fixture, diamond wheel dresser and holder.

Rockford 36-In. Hy-Draulic Openside Shaper

To make possible the surface machining of small work which would not be economical for a large planer and which is still too long for accurate machin-ing on the ram-type shaper, the Rockford Machine Tool Co., Rockford, Ill., has brought 36-In. Hy-Draulic out the Openside Shaper illustrated herewith. This machine reciprocates the work instead of the tool and provides a doublelength bed and planer-type table upon which the work-plece can be supported solidly at all points in its travel. The cutting tool head is carried on an easily adjusted heavy rail which has a rigid brace extending to the rear of the massive column. This construction is intended to retain the speed and convenience of the shaper,

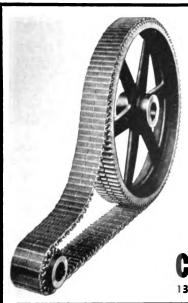
provide the accuracy and easy setup of the planer, eliminating overhang, reduce wear, and insure accurate work.

In addition to the advantages noted, the 36-In. Hy-Draulic Openside Shaper



Rockford 36-In. Hydraulic Openside Shaper

also provides the advantage of hydraulic drive. The hydraulic drive is direct and highly efficient. No power is wasted in driving complicated or unbalanced mechanisms. Cutting speeds and pressures



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are constant throughout the entire cutting stroke and the tools can be worked at maximum efficiency. Any desired stroke length and position relative to the work is available instantly without stopping the ram or using tools. The same ease and complete range of adjustment applies to the hydraulic cross feeds to the table. The reverse is quick yet shockless. Stroke length can easily be altered to follow the contour of irregular work and the tool can be stopped anywhere in the cut, inched or reversed.

Full cutting pressure is always available with complete safety for the machine, tool and work. Operating the stop lever locks the hydraulic circuit and halts the machine instantly without shock or coasting. The machine has very few fast-moving parts and these are submerged in oil or pressure lubricated.

The heavy box section bed is double the stroke length and contains a large reservoir for hydraulic oil. The hydraulic cylinders are fully enclosed. Three ranges of cutting speeds are provided, each having infinite adjustment between the maximum and minimum. Quick-clamping dogs provide accurate adjustment of stroke length without stopping

the machine or using tools.

The heavy rail has integral triangular box section brace and is securely anchored to the column on widely separated ways. The head is heavy, accurately mounted and gibbed to the rail, and has micrometer adjustment for the tool slide. A similar head for side mounting is available. Centralized controls provide easy engagement of power transverse feed of the rail head in either direction, of tool slide up or down, and manual adjustment of both. A massive box section column, designed in the modern manner, is accurately and securely anchored to the bed. Hydraulic controls are centralized on a neat, self-contained panel.

The minimum stroke is 1 in., nominal stroke, 36 in., and actual stroke, 38½ in. Vertical travel of tool, 9 in.; horizontal travel, 30 in. Vertical adjustment of cross rail, 24 in. Maximum distance, table to cross rail, 24 in. Length of table, 58 in.; width of table, 21½ in. Working surface of table, 21½ in. Length of bed support for table, 74 in. In Table aspead changes infinite. Numerical strategies of table, 21½ spead changes infinite.

Table speed changes, infinite. Number of feeds, infinite. Range of vertical and horizontal feeds, 0 to 0.100 in. Height, 6 ft. 10 in. Floor space required, including motor, 4 ft. by 9 ft. 4 in.



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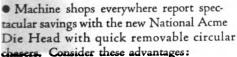
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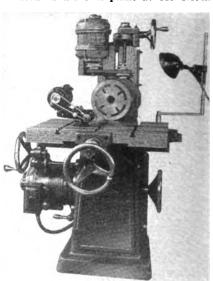
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Hack Universal Die-Making Machine

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that stands alone in its field.

Faced in his own plant at 440 North

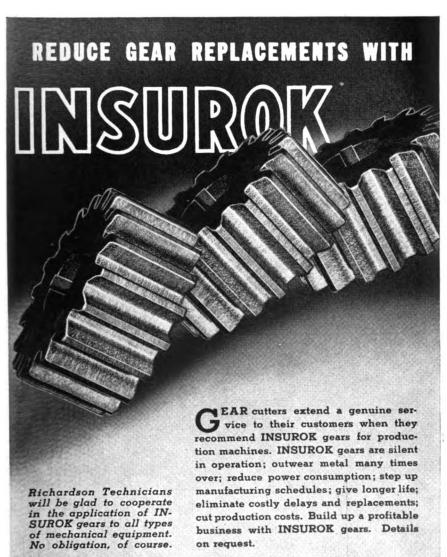


Hack Universal Die-Making Machine

Oakley Boulevard, Chicago, with the ever present problem of time wasted in shifting from machine to machine with the attendant delay of locating parts, Mr. Hack conceived the idea of economizing time and labor by combining the major operations in one machine. This multiple use machine, occupy-

ing only four feet square of floor space, was designed and built to do all the mechanical and most of the hand operations which until now have required the use of separate machines and expert artisans.

The requirements which have been met in the actual performance of this machine include two distinct ranges of cutting properties, heavy and sensitive duty and the inclusion in one machine



The RICHARDSON COMPANY

Melrose Park, (Chicago) Ill. New Brunswick, N. J. Founded 1858

Lockland, (Cincinnati) Ohi Indianapolis. Ind.

Detroit Office: 4-252 G. M. Building, Phone Madison 93 New York Office: 75 West Street, Phone Whitehall of reciprocating as well as rotary motion, together with the performance of a maximum number of operations with a minimum of attachments, each easy of adjustment and so designed that lifting of heavy parts is unnecessary.

Stripped of all removable units the machine consists of a base, a spacious compound table, a reciprocating rear ram, adjustable for stroke of position and lockable in a stationary position if desired. To this ram is fitted a master head to which other attachments are fastened, and incorporated in this head is a back-geared milling spindle vertically adjustable within the ram, thus embracing all the functions of a horizontal milling machine. The head also serves as a lathe spindle, increasing the adaptability of the machine.

Multiple uses are made possible by the vertical head, which is simply and easily attachable. Rotatable throughout a circle, it affords eight speeds; four back geared and four high speed, and there are four speeds in the angular position, all back geared. In connection with this spindle, but removable from it, is the sensitive slotting head, used also for filing and lapping and other reciprocating operations, which can function at any angle.

A hack saw frame instantly attachable to the master head and using standard blades can be used interchangeably with an elevated table or with the centre plate in the table top. Electrical equipment consists of a three h.p., 60 cycle, 220 meter 3 phase motor which drives the ram and a % h.p. unit for the master head.

Fifteen different kinds of cutting operations are done with the regular equipment and this number can be doubled with auxiliary adapters.

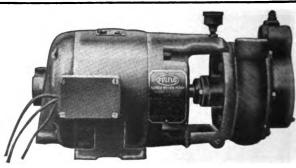
"Cincinnati" Disc Grinders

The Cincinnati Electrical Tool Co., a division of The R. K. LeBiond Machine Tool Co., Cincinnati, Ohio, has announced the addition of several sizes of disc grinders to their general line of such equipment. The grinders may be had in the double end disc type as shown in the illustration, or with a disc on one side and a conventional type grinding wheel and wheel guard on the other side.

The discs are of high grade steel accurately machined and balanced to ensure running true. The spindle is of nickel steel dynamically balanced and mounted



- QUIETNESS
- RELIABILITY
- MAXIMUM PERFORMANCE



CENTRIFUGAL COOLANT PUMPS

THESE UNITS CAN BE MOUNTED IN ANY POSITION

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BLANCHESTER, OHIO

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FINISHED - with adequate allowance for final machining **—ELEPHANT BRAND** PHOSPHOR BRONZE BUSHINGS save you the time, trouble and waste of machining from scaly castings.

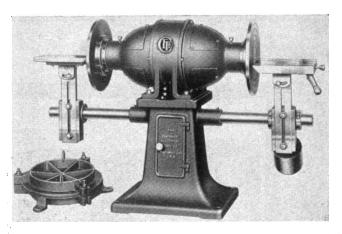
Available in 12" bars. machined with 1/32" plus O.D. and 1/32" minus on the I.D. up to and including 3" diameter . . . also, from 3" to 6" inclusive, with 1/16" plus O.D. and 1/16" minus on the I.D. Maximum I.D. S-4".

Details and stock lists (214 sizes) upon request. WRITE. NOW!

THE PHOSPHOR BRONZE SMELTING COMPANY

2206 Washington Avenue, Philadelphia, Pennsylvania





Cincinnati Disc Grinder

on extra large ball bearings with special provision for both radial as well as thrust loads.

On the double disc grinder a table with hand lever feed is regularly supplied on the right-hand side of the ma-

chine with a plain table on the opposite side but this equipment may be to suit changed individual requirements. On combination unit a table with hand lever feed is regularly furnished on the right-hand side, with a fully enclosed safety wheel guard for the grinding wheel on the other.

The steel discs furnished as standard equipment may be had for either glueing on abrasive discs or properly drilled for mounting steel-back abrasive

discs. A disc press can be supplied for glueing abrasive discs to steel discs.

The motor supplied is of the fully enclosed type with magnetic starter with both overload and no voltage protection and push button control.

Grinds

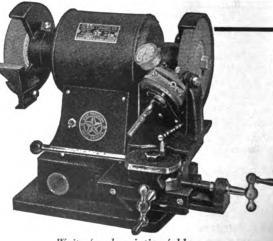
81 SIZES OF

Drills

No. 31 to 1/2"

This Star Precision Grinder puts drill grinding on a production basis. Its simplicity and accuracy saves as high as 50% on drill costs and insures uniform accuracy that guarantees perfect holes and increases production.

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Division of Star Electric Motor Co.

BLOOMFIELD, NEW JERSEY



• Manufacturers of anti-friction ball and roller bearings that are world famous for their maintenance and lubrication economies . . . SKF Industries, Inc., depends on Lyon Steel Shelving for the economical storage and smooth flow of hundreds of types and sizes of bearings from production line to users.

Another example of the versatility and practical economy of Lyon Steel Shelving. Because it combines maximum utility, flexibility and salvageability, Lyon Steel Shelving is a lasting asset. It permits quick, low-cost rearrangements and additions at any time . . . is not affected by dampness . . . resists fire . . . will not warp, swell, shrink or split. Mail coupon for full details.

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LYON	LYON METAL PRODUCTS, INCORPORATED 1309 River St., Aurora, Illinois Please send information as checked:
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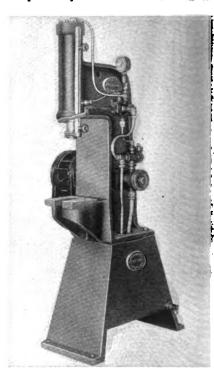
Order through your mill supply house

LAMINATED SHIM CO., INC.

Manufacturers
LONG ISLAND CITY, NEW YORK

Greenerd Two and Four-Ton Hydraulic Presses

A hydraulic press in both two and four-ton sizes is now being made by Greenerd Arbor Press Co., Nashua, N. H. The frames of the two sizes are identical, the difference being in the pump and motor equipment. The frame is case of special hydraulic semi-steel and the



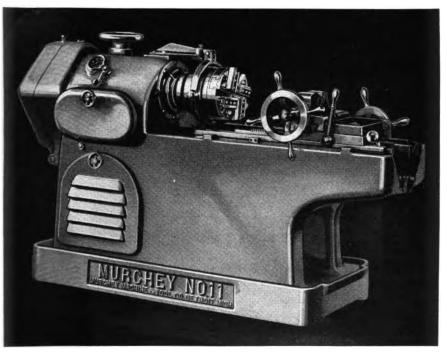
Greenerd Hydraulic Press

press is equipped with a 3½-in steel piston with three cast iron rings. Rams are of alloy steel and are packed with chevron type packing. The glands are equipped with a bleeder pipe to take care of any surplus seepage.

The motor and hydraulic pump are mounted on opposite sides of the main housing and the pump is connected between a 16-gal, sump in the base and s pair of hydraulic valves mounted on the

side of the frame.

Power is applied by means of a hand lever, and pressure will remain on the



MORE and BETTER THREADS

You can get *more* and *better* threads with this new threading machine—the latest in design and modern improvements.

You can learn about this "profit-maker" from the new Murchey catalog which diagrams and explains the No. 11 and No. 22 machines. The catalog shows various views of the tangential

chaser die head, a sectional view of the whole machine and details of the heavy forged steel spindle with integral flange.

It will pay you to investigate this machine.

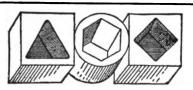
Write today for catalog.

MURCHEY MACHINE & TOOL CO.

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work until the lever is released, this movement automatically returning the ram up to a power stop which may be set at any predetermined point. The press has an adjustable stroke from 1 to 16 in. and the ram is 2 in. in diameter. Pressure may be set at any point between ½ ton and full capacity of the press.

When the press is equipped for two tons pressure, equipment may be supplied to give a ram speed of 276, 224 or 150 in. per minute on the down stroke under full pressure as preferred. The return stroke would be 480, 330 or 216 in. per minute. When equipped for four



DRILL THESE HOLES

By a Quick, Easy, Inexpensive Method Your business letterhead will bring literature. WATTS BROS. TOOL WORKS Wilmerding, Pa. tons pressure, equipment may be furnished to provide a ram speed of 132 per 200 in. per minute on the down stroke for which the return stroke would be 216, 330 or 558 in. per minute.

The working surface of the table is 8x8 in. with a 2¾-in. slot. Height from floor to table, 34 in. The press is equipped with a 3 h.p. motor in all cases except that of the four-ton press equipped for 200 in. speed per minute, for which a 5 h.p. motor is required. The machine is completely self-contained and ruggedly built.

Racine Vertical Feed Metal Cutting Saw

Racine Tool & Machine Company, 1770 State St., Racine, Wis., has brought out a power saw of the dry cut type in the design of which a simplified hydraulic feed principle is incorporated. The feed dial gives an infinite range of pressures from zero to maximum as required to cut all classes of material including mild and cold rolled, alloys, tool steels, high speed and stainless steel.

The hydraulic system consists of a simple plunger pump, cam-operated. Hydraulic pressure is applied to the top



BETTER Broaches for every job and the only broaches for some jobs.

> MORE parts per grind MORE grinds per broach 25% to 35% Longer Life.

Write for NEW bulletin today.

The Connecticut Broach & Machine Co.

New London, Conn.



NO QUESTION about Oilgear Surface Broaching Machine PERFORMANCE

 One or pieces finishbroached simultaneously

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Each unit complete and selfcontained

 Single lever, semi - auto matic control

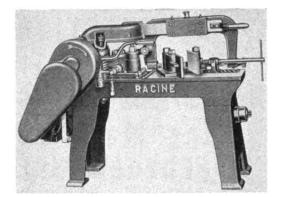
 Automatic full interlock of broach and shuttle tables

• Welded allsteel construction

6, 10, 16, 20 ton capacities

The Oilgear Variable Delivery Pump has enough long and exacting service behind it to demonstrate beyond question its greater smoothness of operation, its greater dependability of performance, what it means in reduced maintenance costs. And just as you would expect, this famed pump, applied to Oilgear Surface Broaching Machines, is setting new high marks in production at the closest tolerances desired. For what Oilgear means in terms of your problems, write for full information including Bulletin 23,000A. THE OIL-GEAR COMPANY, 1323 W. Bruce St., Milwaukee, Wis.

OILGEAR BROACHING MACHINES



Racine Vertical Feed Metal Cutting Saw

of the feed cylinder through a valve with numbered dial for varying the pressure. The entire hydraulic system with valves, cylinder and controls is self-contained in a removable cast iron case. The system is very compact, with provision for draining all possible oil leakage back to the oil reservoir. Three quarts of automotive crankcase oil are sufficient to operate the machine for many months.

The capacity of the machine is 6x6

in. The vise can be swiveled to 45 deg. Power is supplied through a V-belt drive from the motor to the drive gears and two speeds are available. The machine cuts very accurately at the rate of two to three square inches in mild or cold rolled steel per minute. Four-in. rounds are cut in eight minutes and 3-in. rounds are cut in five minutes.

Hauser Type 2BA Precision Jig Boring Machine

The illustration shows the Hauser Type 2BA Precision Jig Boring Machine which is now being introduced in this country by The B. Y. Berner Co.

being introduced in this country by The R. Y. Ferner Co. 161 Devonshire St., Boston, Mass. The features of the Hauser machine are maximum rigidity, exceptional drilling and boring capacity, durability, and an unusually large working range. Of particular note is the completely centralized control. From the operating position all controls are within convenient reach from the front of the machine.

The spindle head, gear box and vertical slide form an independent unit as



THIS MARK

The sign of DEPENDABLE ACCURATE GEARS of all TYPES and MATERIALS for all kinds of MACHINE TOOLS and FOR POWER TRANSMISSION EVERYWHERE.

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GEARS

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Diefendorf Gear Corporation
Syracuse, New York



Actual working tests have shown conclusively that this little giant has no equal in the small production drill field. Here is a real tool, not a toy, capable of sustained high speed production WITHOUT OVER HEATING. Perfectly balanced and ingeniously ventilated, it can be operated indefinitely without discomfort. It is not only the smallest, lightest ¼-inch drill on the market (2½ lbs.) but also the most powerful. For work of a one-handed nature, no other drill ever made

can be handled with such perfect control and so little fatigue.

Its simplicity of design and construction denote the skillful engineering of a finished tool. It can be taken down and re-assembled in five minutes. Quiet operation and long life are assured by heat treated chrome molybdenum helical gears, over-size Oilite spindle bearing, ball bearing armature and thrust bearings.

Write for complete details of this remarkable new drill and of the many other fine pawer tools in the impartant Millers

Falls line. Ask us to demonstrate "Dyno-Mite's" superiority on your own work.

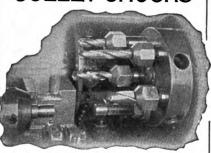


MILLERS FALLS COMPANY

Greenfield, Massachusetts

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UNIVERSAL COLLET CHUCKS



Automatic Screw Machine, holding Drill - Counterbore - Center Drill and Reamer in UNIVERSAL COLLET CHUCK

[One of the Many Uses]



For Holding End Mills, Drills, Taps, Center Point, Keyway Cutters etc.

FOR LITERATURE WRITE TO

UNIVERSAL ENGINEERING CO. FRANKENMUTH, MICH. distinct from the machine base with the table and cross slide. The vertical slide member feeding into the machine base provides exceptional stability when drilling, as the guide length is greatly in excess of the overhang of the spindle head.

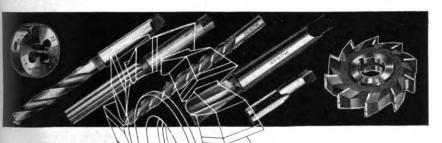
The table is set by the method of right angular coordinates, and the completely covered measuring system, which



Hauser Type 2BA Precision Jig Boring Machine

incorporates corrector bars, allows setting to be made to 0.0001 in. The measuring screws are of a special steel and are of large dimensions with suitably large thread flanks. The graduated dials and verniers are large and easily readable through glass covers. The clamping devices are operated by levers brought to the front of the cross alide. The clamping action is direct and positive. The table slots and front face of the table are in perfect alignment with the guides.

The spindle is operated by a 1 h.p. motor operating at 1400 r.p.m. The



INVISIBLE ALUES

PRODUCTION

Are "invisible values" slashing away at your production costs, bringing to your metal-removing tools greater cutting efficiency, less breakage, longer time between resharpening?

They are if you use Morse Tools. The "invisible values" are Morse Extra Values—hidden superiorities in every tool that bears the Morse trade mark. In putting them there, years of manufacturing experience play a part. So does carefully-controlled heat treating. Unusually accurate grinding. Step-by-step inspection.

Do you have doubts about a difference between various brands of metal-removing tools? Then let Morse extra values prove themselves in your own shop. The Morse laboratory, with many years of tool engineering experience, will cooperate on any problem.

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DIFFERENCE

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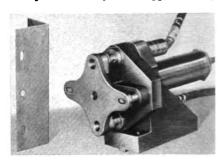
drilling capacity in cast iron is 23/32 in.; in steel, 19/32 in. Boring capacity is 1½ in. The working surface of the table is 17½x12½ in. Longitudinal movement of the table is 13¾ in. and the cross movement is 8 in. Maximum distance of spindle to table, 20½ in. Vertical adjustment of spindle head, 17½ in. Vertical movement of spindle, 4 inches.

The spindle has a Morse No. 1 taper. Nine spindle speeds are available: 120, 180, 270, 400, 600, 900, 1300, 2000, and 3000 r.p.m. Feed of spindle per revolution, 0.003 inch.

The diameter of the circular table is 12 in Angular reading is 5 seconds. The diameter of the inclinable table is 6½ in. Reading for circular table, 5 seconds; reading for tilting of table, 1 minute. Net weight of machine with motor, without circular table, 1540 pounds.

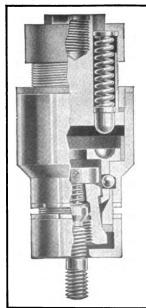
Progressive Hydraulic Self-Stripping Punching Units

Individual punching units that may be used in any production set-up or built into production fixtures by the manufacturer to suit his own specifications have been made available by Progressive Welder Co., 737 Piquette Ave., Detroit, Mich. The units vary in size from 1½ to 4-in. cylinder diameter. The pressures vary from approximately



Progressive Hydraulic Self-Stripping
Punching Unit

2650 lbs. in the $1\frac{1}{2}$ -in. diameter to 19,000 lbs. in the 4-in. diameter. Cylinders vary in length from 8 in. to 10 in. The diameter of the stripper cylinder varies from $\frac{3}{4}$ in. in the $\frac{1}{2}$ -in. model to 1 in. in the 4-in. model. Travel is $\frac{3}{4}$ in, on all types.



TITAN STUD SETTER CONTROLLED DRIVE Assures Perfect Setting

The Titan Stud Setter has a safety clutch which controls driving power.

The Titan is positive in driving and automatic in releasing, thus making it possible to set the stude to any predetermined degree of tightness.

When the studs are driven to the specified tightness, the drive is automatically released and the tool may be removed without fear of mutilating or distorting the threads.

The great capacity, speed range, utility, and safety of this production tool make the Titan Stud Setter a profit-earning tool wherever it is used.

Write today for the new illustrated circular.

TITAN TOOL COMPANY

FAIRVIEW

PENNÁ.

DO YOU LIKE Flat With a spring-like "feel"?

THE peculiar spring quality of our tempered High Carbon Flat Wire has impressed and pleased a large number of concerns who are "hard-to-please" buyers of this product. Great resiliency, straightness, and strict uniformity of temper are among the qualities which this wire possesses.

The particular Roebling spring steel shown below is a tape steel ...tempered, polished, and blued.



Roebling
COLD ROLLED
STEEL FLAT WIRE

It is a very tough, resilient wire ... very accurate dimensionally, free of defects on the surface and edges, has high tensile strength, and is uniform in temper.

If you require cold rolled steel flat wire made up to exacting specifications...wire which calls for close attention to details and careful checking throughout production...it would pay you to investigate our product and our facilities. We specialize in this type of work and our organization is trained to handle it. We have had over 40 years of experience.

JOHN A. ROEBLING'S SONS COMPANY TRENTON, N. J. Branches in Principal Cities



DBLY A FINE PROBUCT MAY BEAR THE NAME ROEBLING

The stripper cylinder, being hollow, also acts as a guide pin for the punches. The exterior is hardened and ground for wear and alignment. Each unit will cover a working area of approximately 8-in. diameter and as many punches can be mounted as this space allows and the capacity and size of the cylinder permit. Standard punches and dies are used and can be mounted on the heads in any location, and are as interchangeable on different jobs as the cylinders themselves.

The units can be operated singly, in multiple, or alternately as desired. Any reversing type hydraulic valve is suitable. In the operation of the punching unit, the stripper first positions the work against the die and by reversing the valve the punch follows through, piercing the holes. The punching unit may also be used for embossing or trimming on light gauge sheet metal parts. The units have full salvage value as only relocation and changing of the punches is all that is necessary to adapt the units to any production change.

Power of approximately 1500 lbs. pressure per square inch maximum is supplied by electrically driven hydraulic pumps. Any type of hydraulic pressure unit will operate these punching units,

although Progressive supplies one especially engineered for this purpose. Special high production fixtures can be engineered by this firm as required.

M-B "Heavy Duty" Air Grinder

The illustration shows the M-B "Heavy Duty" Air Grinder, now being offered by M-B Products, 130 E. Larned St., Detroit,



M-B "Heavy Duty" Air Grinder

Mich. The features of this grinder are the three stages of power and three ranges of speed, together with a simple governor which regulates the maximum speed.

Power is controlled by a series of three



YOU CAN'T BUST

In actual test, we blind tapped a hole in this piece of steel. An "UNBRAKO" was screwed into it and forced through the bottom. The steel split three ways, yet the "UNBRAKO" didn't show a scratch.



SQUARE HEAD SET SCREW

STANDARD PRESSED STEEL Co.

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INDIANAPOLIS BOX 556

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THIS ONE!

Fig. 509

T H A T 'S
STRENGTH—
when any screw
will do that and
come out und a m a god!

That's strength you can use to mit hazards of even establishment of the sixtends severest strains. Send for a sample and just try to break it, yourself. Give it a fair test. Then, switch to "UNBRAKOS", where you can't afford failurest Catalog, upon request.

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CHICAGO

PROLONGED CUTTING-POWER

The beaver's teeth are aces-high as long-duty cutting tools. So are Napier Band Saw Blades. Used in conjunction with the Horizontal Napier Band Saw Machine, they give 100% greater production per blade than is obtainable from an ordinary band saw machine blade . . .



- 1. The Horizontal Napier machine has an automatic floating feed which eliminates destructive vibration.
- 2. Cutting compound is pumped onto the work in a continuous stream at the POINTS of the blade, thus scavenging the chips out of the gullets.
 - 2. Large band wheels prevent checking in the gullets.

These factors—plus long life quality of Napier blades, secured to them by patented design of construction—assure 100% more work per blade. AND THE MOST EXPENSIVE NAPIER BAND SAW BLADE COSTS \$2.46, INCLUDING ELECTRIC WELD.



Yet savings on blade-costs is but ONE of the Horizontal Napier's TEN advantages.

HORIZONTAL NAPIER BAND SAW MACHINE

METAL SAW & MACHINE CO.

40 NAPIER STREET

SPRINGFIELD, MASS.

TEN OUTSTANDING FEATURES

1-Accuracy

2—Speed

3—Small Displacement

4-Prolonged Cutting Power

5-One Horsepower

6-Handles both Large and Small Work

7—No Time Out

8-Low Installation Cost

9—Low Depreciation Cost

10—Skilled Handling Unnecessary air jets and the grinder can be operated on any one of the jets. No. 1 jet makes available the minimum amount of power, No. 2 the intermediate stage and No. 3 the maximum volume, which is in excess of ¼ h.p. The air control is accessible and convenient, consisting of a knurled ring on the back of the body.

The three ranges of speed are obtained by the use of three different governor springs. By changing the governor springs, the maximum speed can be regulated to 25,000, 45,000, or 65,000 r.p.m. Thus the desired speed is available for any type of job. Furnished with each

50 Times Longer Life at These You know about Carboloy's ability to resist abrasive wear on lathe and grinder centers, centerless grinder rests, wire drawing dies, etc. Now-you can use Carboloy to tip your micrometers at their point of wear-give them at least 50 times longer life, and increase their degree of accuracy during this entire period of greater use. Send us your micrometer. We do the rest. Write for descriptive leaflet.

CARBOLOY COMPANY, INC.

2975 E. Jefferson Ave., Detroit, Mich.

CARBOLOY TIPPED ANVILS

grinder is an adaptor for use in the tool post of a machine, affording a most efficient internal grinder.

The grinder is packaged in a finished hard wood case. Included with the grinder are the following accessories: oil resisting air hose with dirt filter, six mounted grinding wheels, two drop forged steel wrenches, two speed change springs, one adaptor to permit of using regular grinding wheels with 1/4-in. holes, and one tool post adaptor.

Atlas Safety Belt Guards

Atlas Press Company, Kalamazoo, Mich., announces that belt shields are now available for any Atlas 9 or 10



Atlas Safety Belt Guard

Series Lathes with self-contained countershafts. The complete transmission of any recent Atlas lathe is fully enclosed after these belt guards are added.

Both guards are aluminum castings with pin-hinges for quick raising and

HOLE-PUNCHING AND NOTCHING DIES

Your first use of WALES DIES will show the savings in time and money they make possible. These individual, sub-press type dies operate in press or press brake. Nothing attached to the press ram. Quick set-up—never obsolete—relocate for new parts. Standard holes up to %"—square notches up to 5x5—Also Vee Notches—14 ga. flat sheet or under.

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THE STRIPPIT CORPORATION

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NEW! Q. A. W. HYDRAULIC CONTROL VALVES

2-WAY — 3-WAY — 4-WAY 1/2", 3/4", 1", 1 1/4", 1 1/2", and 2"



For 1000 Pounds Working Pressure For 2000 Pounds Working Pressure

Sizes including 1" available in heavy bronze forged housing recommended for water and corrosive fluids. Sizes 1" and under also available with housing machined from solid steel slab for oil or soluble oil solutions.



Representative in England: Gaston E. Marbaix, Ltd., London.

NO METAL-TO-METAL CONTACT

Built on the Q.A.W. principle of No Metal-to-Metal wear in the valving action, stainless steel plungers, short travel, and balanced action, these new values offer extremely long life in hard service. Inspection and re-assembly in a few minutes.



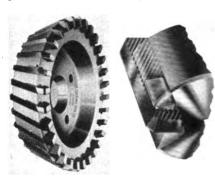
Write for complete new catolog of Air and Hydraulic Valves, "1 M" (key)

It is not necessary to speed changes. remove guards to change belts. The left guard covers the motor-to-countershaft belt and has a special inner guard for the pulley on the countershaft. The right guard covers belt from counter-shaft to lathe spindle. The entire assembly is ready-tapped for easy instal-

"Gair-Lock" Method of Locking Inserted Blades

A new method of locking adjustable, inserted blades in milling cutter heads, of interest to all users of single and multiple blade cutting tools, including boring bars, boring heads and reamers, has been developed by The Gairing Tool Company, 1629-35 W. Lafayette, Detroit. Michigan. The locking member, positioned in a shouldered recess adjacent to the blade slot, fits the serrated blade and locks it securely. Blade and lock are inserted lengthwise. The blade and lock are marketed under the trade name "Gair-Lock".

One of the chief advantages claimed for this blade design is the facility of adjustment. There are no wedges to drift out or upset. A tap on the rear of the blade releases it instantly and it can be set out the required distance A single blade may be removed and replaced without loosening or removing



(Left) Milling Cutter with "Gair-Lock" In serted Blades. (Right) Phantom view illus trating Gair-Lock method of locking cutter in position.

any other blades in the cutter head This is due to the freedom of the blade in the slot prior to Gair-Locking. Another advantage claimed is rigidity. The blades may be set at the correct angle



197

TRIPLE FCONOMY WITH HELLER

CIRCULAR COLD SAWING MACHINES

THE SAW The Heller blade is narrower, requiring less horsepower and wasting less material. These blades are
furnished on a replacement basis — when segments are worn down, a
complete blade is supplied for the price of the segments.

The built vent sim feed insu

HELLER

THE MACHINE

The Heller Hydraulic Cold Saw is built with the precision and convenience of a milling machine—simplified and foolproof — with feeds and blade speeds which insure maximum blade life.

THE GRINDER The Heller Grinder brings the dulled blade back to original Heller Tooth Form. Installed with a machine, one man at no extra

original Heller Tooth Form. Installed with a machine, one man at no extra cost can handle both sawing and blade grinding to suit his own requirements and of the material being cut.

Centralized responsibility in Heller for the Triple Economy assured in Blades, Machines and Grinders.

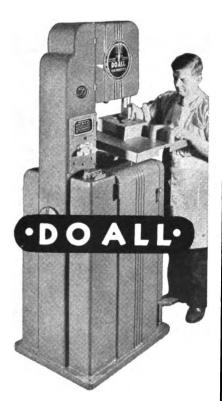


HELLER MACHINE COMPANY

For Contour Sawing

THE DOALL

METALMASTER



INSTANT BUTT WELDING of saws and Dial Control of Speeds now features of this combination DOALL saw and file.

Put this new tool to work for you. Write for Handbook and full information.



and rake to obtain solid tooth cutting action, approaching as closely as me-chanically possible the condition of a solid cutter.

The Gair-Lock unit is said to prevent blade shifting or tilting, permits more blades per diameter, affords greater chip clearance, eliminates serrating of cutter body, makes special bodies for tungsten carbide blades unnecessary.

Dumore "Chief" No. 12 Lathe Grinder

A lathe grinder capable of precision internal and external work and adaptable to a wide variety of machine tools has been placed on the market by The Dumore Company, Racine, Wis. This Dumore Company, Racine, Wis. This grinder, known as the "Chief'," develops



Dumore "Chief" No. 12 Lathe Grinder

one h.p. and is said to maintain precision tolerance on the heaviest production work.

The grinder is powered by a one h.p. capacitator motor which is dynamically balanced to eliminate vibration and preclude the possibility of chatter marks in grinding. The motor is said to deliver the maximum power output for its size. plus constant speed. Grease-packed split-tolerance ball bearings are used and the motor is fully enclosed to prevent dust and dirt from reaching the bearings, rotor and stator.

Power is transmitted from the motor to the quill by two No. 1 section V-belts. Proper belt tension is secured by adjusting the motor on its base. Six sheaves are furnished so that spindle speeds of 2800 to 8200 r.p.m are available. thus insuring the correct wheel speeds

American Swiss Files of Precision Swiss Pattern File

Made in the United States



It is a guide to users in their file purchases.

More than 2000 shapes, cuts and sizes enable one to select the exact type of file for the job. The uniform size, shape and cut, in addition to the uniform hardness and the high quality of American Swiss Pattern Files, assure longer file usage and better work.

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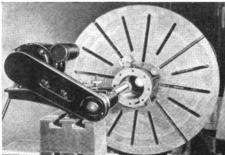


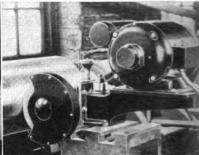
AMERICAN SWISS PATTERN FILES

American Swiss File & Tool Co.

Elizabeth, N. J.

Also manufacturers of Mechanics' Hand Tools and Knurls





(Left) Dumore "Chief" Grinder set up for deep internal grinding, using a M-20 quill. The quill grinds to 20 in. deep on holes of 2\%-in. diameter or larger. (Right) Dumore "Chief Grinder set up in a large lathe for refinishing the piston of a large hydraulic hoist.

for wheels from 8 in. to 3 in. in diameter. Proper alignment of the motor and quill sheaves is assured by a slot in the motor frame and dowl in the base.

Six quills are available; one external and five internal—all capable of 0.0001 All quills are equipped in. accuracy. with the Dumore patented oiling system which lubricates each bearing with a constant fog of oil.

six sheaves, two T-bolts, one belt guar two V-belts, one No. 20 diamond dresse one can Dumore oil, three wrenches, th necessary wheel collars, and shipping boxes for each quill, motor and bracke

Toledo Special Automatic Press

The press illustrated in the about photograph was recently adapted by \$2 Toledo Machine and Tool Co., 1420 Has

"FACE VALUE",

The "face value" of a Dial Indicator is its ability to give accurate readings at all times—even under severe punishment.

Standard's new "Shockproof" construction protects the delicate mechanism from shocks that would destroy the precision of the average dial indicator. Standard Dial Indicators are made to "take it" and still give you accurate readings.

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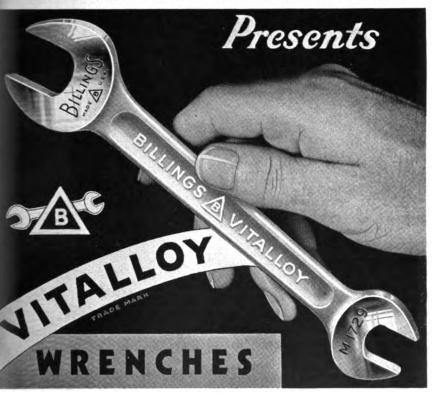
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That To housing guarantee saves you at least 75% of your wrench repoirs and having wrenches out of commission—a valuable economy.

But the property gives you also tremendous strength because it's all-alloy now with alloy handle and chrome molybdenum jaws, heel jaw replaceable, hook jaw full-floating and made with handy pipe scale. Adjusting nut spins easily in every size, 6" to 60". Altogether, a wrench with satisfactions you can't find in any other.

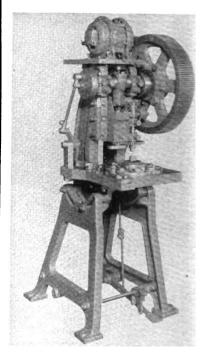
Ask your jobber.

THE RIDGE TOOL CO.



ings St., Toledo, Ohio, division of E. Bliss Co., for a special piece of work quiring an eight-station dial feed etching with acid, the trade-mark number on hardened steel parts. tached to the slide is a rubber st die which is rotated 180 deg. at estroke of the press.

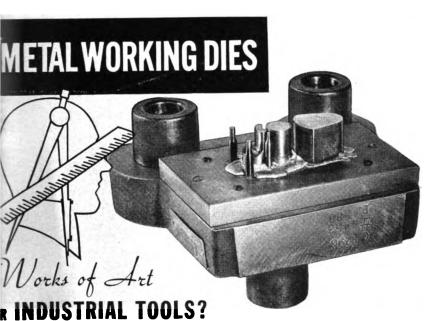
The back stamp die comes de touching a pad of acid, then on the restroke rotates 180 deg. to the front applies it to the work which has a placed under the die by the dial



Toledo Special Automatic Press

At the same time that the die with tacid has rotated to the front, the othat was in front rotates 180 deg. to trear to pick up more acid for the name impression. Thus, a piece is etched each stroke of the press and, contining around in the dial, is dropp through a hole in the bolster into container.

The press, itself, is a "Toledo" No. open back inclinable, with a 1½-1 stroke, 6-in. shut height on the bed at a 1-in. bolster. A ½ h.p., 900 r.p.:



ES, far too many metal working dies are made at ch high costs that they might be put in the class of orks of art. Yet, slow, costly "fitting and filing" ethods are unnecessary with most dies.

ome of the largest concerns are saving money by using the CERROMATRIX method to locate and secure punched die parts—not only on short run dies on light atterials, but also for long runs on metals up to 5/32" sick.

ERROMATRIX, a bismuth-lead-tin-antimony alloy, lelts at 250° F. and expands slightly on solidification. abstantially reduces cost, time and uncertainty of die instruction by making it unnecessary to use complicated biding devices or to machine non-working surfaces to lose dimensions in locating parts.

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motor is geared directly to the flywheel supplying the motive power.

Sundstrand Model 10PWX & 5PWX Pump Units

The Sundstrand Machine Tool Company, Rockford, Ill., announces a line of hydraulic pump units with the control valves built into the pump housing. These units are extremely compact and are made in two sizes, the larger being the Model 10PWX and the smaller, the 5PWX.

An entirely new feature in the 10PWX unit is a variable displacement piston pump which can be furnished with three different feed rates: fast, medium and slow feed, each of which is independently adjustable. In addition there is a constant volume pump in this unit which provides rapid traverse. Both pumps are driven by a single shaft.

The main control mechanism is in the pump housing and may be actuated by a simple hydraulic remote control valve which is tripped by dogs on the moving member. An alternative control is electrical switches and trip dogs in conjunction with solenoid valves.

Either the hydraulic remote control or

the electrical switches provide the t pre-set rates of feed and rapid train either direction. This same of arrangement is used for the Model S



Sunstrand Model 10PWX Pump Uni

The small size of these units togs with such a simple and flexible con makes them ideal for machine tool is and other applications. The pumps driven at motor speed 1200 r.p.m. are quiet in operation. Extremely small feeds are obtained due to the mult



PUTNAM HI-SPEED SPIRAL FLUTED CHUCKING REAMERS cut with exceptional speed and never fall to leave a smooth, accurate hole! They're guaranteed for quality of material and workmanship—your assurance of long, dependable service. Furnished with left hand spiral, right hand cut, with both straight and taper shanks. There's no doubt about it . . . they will meet YOUR most exacting production requirements.

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ependability is well known to machinery buyers. And at operation Formica gears make possible is a strong point. They help to sell the machines.

a gears also make life easier for maintenance engineers, uy replacement gears of Formica from the leading named on this page.

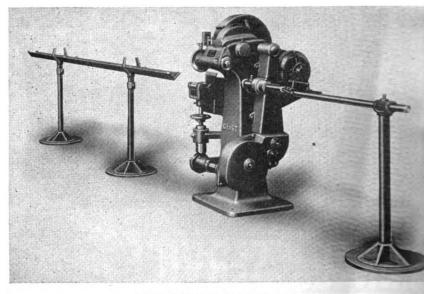
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Geist Semi-Automatic Roller Cutter

piston pump design, which is an exclusive Sundstrand feature.

The 10PWX pump illustrated is provided with the three independent feed rates, an advantage which is highly desirable for wide facing operations as well as for boring, reaming and counterboring multiple diameter holes.

Geist Semi-Automatic Roller Cutter

The Geist Manufacturing Company, whose product is sold through the Landis Machinery Company, Waynesboro, Penna., has placed on the market a semi-automatic Roller Pipe Cutter in the operation of which the operator is re-

lieved of all duty other than fee the pipe into the machine.

The machine incorporates many features of design, the most notewo of which is the operation of the roby a cam action. Both the hand I and foot pedal have been elimins. The movement of the rollers in a tical plane is actuated by a gear dridisc cam. Separate cams are neces for standard wall and extra heavy p

The operating cycle of the machin controlled through the medium of p off gears. The gear train is arranged that by reversing one pair of gears employing an extra pair, furnished standard equipment, four different spe



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Save time and money in lifting and handling heavy dies, tools, etc., in your tool room or stamping shop. All steel construction—anti-friction bearings—furnished with hand or electric power. Special tables built for your requirements. Write for illustrated circular.

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Simple Change to the Modern Assembly Method eliminated tap breakage...



you standing the expense of tapping and ping troubles that could be avoided? A rker-Kaion Assembly Engineer will give an blased answer that may save you money.

re is the record on two of the hundreds of malacturers of widely different products who he made sizeable reductions in assembly costs switching from machine screws to Parkerlon Hardened Self-tapping Screws:

rel-Chase Mfg. Co., Chicago, paid heavily for breakage and rejected parts when they were ping the formed steel rod handles which are ached to the 22 gauge steel body of their obsers. A change from machine screws to Her ad type Self-tapping Screws ended the tapping d trouble...saved approximately half of former tembly expense.

wman X-Ray Products Corp., Long Island ty, encountered high breakage of taps in alunum alloys during assembly of frames for tir film holder. By using Type "Z" Self-tapping Screws a 40 percent reduction was made in assembly costs, and assembly speed was doubled.

In both cases, the change in assembly method resulted in stronger as well as cheaper fastenings. For it has been proved that Parker-Kalon Hardened Self-tapping Screws hold better under vibration, tension and shear stresses than machine screws, bolts and nuts, etc.

Let us help you investigate this cost-cutting method of assembling metal and plastics

On your own work it is likely that fastening jobs could be simplified and economies effected by using Hardened Self-tapping Screws in place of ordinary devices. In 7 out of 10 cases where metal or plastic assemblies are required this method can be used to advantage for all or part of the fastenings. A Parker-Kalon Assembly Engineer will call on request to go over your fastenings with you and point out all opportunities. A letter to us obtains this service without obligation.

PARKER-KALON CORPORATION Department M, 198 Varick Street, New York, N.Y.

PARKER-KALON Modern FASTENING DEVICES

HARDENED SELFTAPPING SCREW FOR EVERY KIND OF ASSEMBLY

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are available. The speeds are fixed so that it is possible to cut off from 10 to 35 nipples per minute depending upon the pipe diameter. A removable cover

protects the gear train.

The Geist Roller Pipe Cutter is equipped throughout with anti-friction bearings, a heavy duty roller bearing being used on the cutter disc spindle to assume the thrust load of a heavy cut. A high pressure greasing system is used to insure positive lubrication.

Another feature of this new Roller Cutter is the lubricator, built into the machine for lubricating and cleaning the cutter disc. The lubricator, adjustable for any diameter of disc, consists of a reservoir that holds about one pint of oil. A needle valve controls the flow of oil permitting just enough lubricant to flow into two felt pads which are in constant contact with the cutter disc under spring tension. This insures positive and continuous lubrication.

A new type of pipe support replaces the old type pipe stand formerly furnished with this machine. This new support is in the form of a trough which eliminates the gripping of the pipe while under cut. The trough is 10 feet long and is lined with a series of metal strips so placed as to minimize any friction between the pipe and trough. These strips form a bearing which the pipe rotates and permit rapid advancement of the pipe after cut-off operation has been compared to the trough is mounted on a new of support. A quick action clamperables the operator to raise or lower support quickly to any desired he arms extending above the trough a inate the possibility of the pipe farout.

Savage Nibbling Machines Redesigned

W. J. Savage Company, Knox Tenn., has re-designed their line of age Nibbling Machines. These new chines are considerably improved in exclusive features, such as Direct-Center Drives, totally enclosed hand one-piece revolving heads are it porated. The new nibbler is more perful, has fewer working parts an asfer and easier to operate. There no moving parts in the streamlined erating heads except the metal cut tools. Fast and accurate cutting it complished by guide template or scribed line. Alloy steels may be



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We used to call 'em safety screws, the hollow safety, then hollow hex—snow hollow set screws. But, through these years and changes, there's on name that's stuck . . . "MAC-IT MAC-IT screws always have been alsteel, the same in all sizes and type then properly heat-treated. Yes, we called 'em lots of names, but no lones. MAC-ITS are old friends of or

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as easily as boiler plate, and the machines are sufficiently powerful punch starting holes to one-half recapacities. This feature is quite an vantage when inside cutting is requi A few exclusive features in this

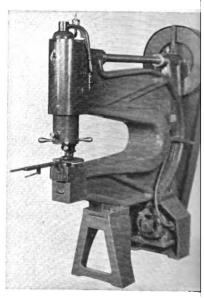
and improved nibbler are:

1. Direct-Over-Center-Drive.

increases power in nibbling punching starting holes.

2. Totally Enclosed Head prot working parts and operator, provides better lubricating m

3. One-Piece-Revolving Head



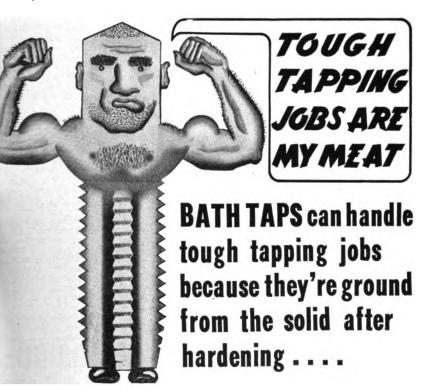
Savage Redesigned Nibbling Machine

vides fewer working parts more substantial operation.

4. Combination Collet and Lock holds tool in place tightening and simplifies changing.

5. Re-designed Main Frame provi additional strength and bet balance.

The new Savage Nibblers are const atively rated to cut from 1/2 in. to 1/2 thick sheet metal and have a range throat depths from 8 in. to 36 in. handling sheets in any length and 16 in. to 72 in. wide. The older metal cutters manufactured since with capacities for cutting 34 in.



the Bath hardening process, blanks are hardened, tempered, thened and then the teeth are ground. Thus, the thinnest is of the teeth have the same perfect grain structure as the tof the tap.

a result, these perfect teeth stay sharp longer, cut more trately and allow more tapped holes per tap.

you, this method means lower costs, greater accuracy, and ter production—in a word, greater profits.

y not give BATH TAPS a chance to handle your tapping plems—especially the tough ones?

OHN BATH & CO., Inc.

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PAYS TO BUY BATH "Ground from The Solid" TAPS

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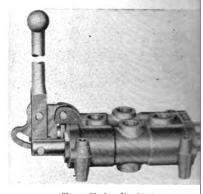
Hunt Hydraulic Valve

The C. B. Hunt & Sons Company. Salem, Ohio, has brought out a hydraulic valve the design of which embodies the same no metal-to-metal wear principle and minimum of moving parts as characterizes this company's already well line of "Quick-As-Wink" Control Valves.

Illustration shows bronze forged housing valve hand lever operated, for 4-way This valve is also built for 2-way and 3-way operation and is made in ½-in., ¾-in. and 1-in. sizes, in two styles, for 1000 pounds working pressure and for 2000 pounds working pressure. The bronze forgings used as housings are among the largest bronze forgings ever made.

The employment of the dropped forged bronze housing with its high physical strength affords an additional factor for long life with water or corrosive fluids.
In the "Quick-As-Wink" valving prin-

ciple, the valving operation is accomplished in the 2-way valves by only one. moving part; in the 3-way and 4-way valves by coincident motion of two valve bodies or plungers. The valve



Hunt Hydraulic Valve

bodies or plungers are made of stainly These are "free-floating" in s cial packings, avoiding metal-to-me contact. Balanced port action in o junction with the valving ring and no metal-to-metal contact, is claimed provide a combination for extremely ld life and satisfactory performance in he service. Short travel is an aid to operation.

Accessibility is such that complete spection replacements of parts and



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assembly can be made in a few minutes and without disturbing the hydraulic piping. Connections are provided so that piping may be permanently connected above or below housing. The only internal moving parts, the stainless steel valve bodies or plungers in several years of hard, continuous service have shown imperceptible wear due to valving action, in millions of operations. Complete new catalog of "Quick-As-Wink" Air and Hydraulic Control valves is now available.

Electroloy Cold Formed and Plated Electrodes

The Electroloy Company, Inc., 50 Church St., New York, N. Y., announces two major improvements in the line of electrodes marketed by this firm.

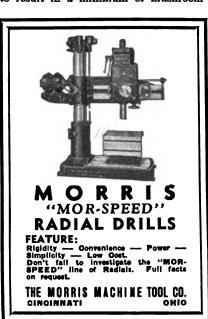
In place of the conventional machined spot welding tip, this company now offers electrodes cold formed under tremendous pressure and employing Electroloy standard highly conductive alloys. The cold forming is said to produce a fine, uniform grain structure with an additional 10 to 12 per cent increase in adherence. This construction is claimed to result in a minimum of mushroom-

ing or deformation of the electrode an consequently an increase in the numb of spot welds per tip.

According to this company, research has indicated that considerable loss current and overheating of the electron has been caused by oxidation on th surface of the electrode at its point of contact with the adaptor. To rectif this condition, the Electroloy Compan now plates electrodes with a thin elect trically conductive coating of a specia alloy which is highly resistant to oxida tion. This plate is said to result in les heating of the electrode and conse quently less softening and deformation Standard tapered electrodes in all siz and incorporating both of these in provements are now available. test purposes will be forwards gratis upon request.

Safety Tu-Way Hammer or Vise Belt Lacer

With a hammer and the new "Tu-Way" Belt Lacer now being made by Safety Belt-Lacer Co., Toledo, Ohio, the belt can be laced with a lacing practically the same as that procured with the usual type of belt lacer. Or, if a vise



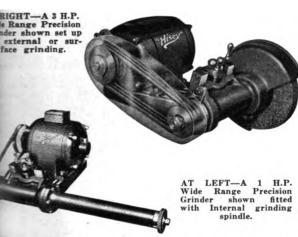


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matter how well equipped a Grinding Departnt may be, a job will turn up which cannot be
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the cylindrical grinder, a roll too large or a
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de Range Precision Grinder mounted in a lathe,
ting mill or planer will save the day.

th interchangeable heads, these Grinders do emal, internal or surface grinding operations.

Internal Grinding Head with open dle. Is interchangeable with heads of above machine. They are capable of extreme accuracy and are ruggedly built for production work.

Sizes range from 1/4 to 10 H. P. capacity in a number of different models.

New Bulletin No. 51-M gives complete information.

HE HISEY-WOLF MACHINE CO.

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CINCINNATI, ONIO, U.S.A.

Electric DRILLS . . . GRINDERS . . . BUFFERS



is handy, the lacing may be made in a vise.

To lace with a hammer, a strip of "Safety" Belt Hooks is cut to the desired length and inserted into the lacer magazine as far as they will go so that the retaining pin may easily be inserted. The belt is then inserted between the spiral spring pressure jaws and the end of the belt is pushed squarely and firmly against the magazine. With the hooks resting on a hard, smooth surface, such as a steel plate, the hooks are hammered in, a few at a time and only partly in until all are set. The hammering is

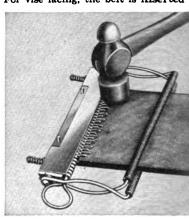


This machine quickly stamps details and serial numbers into name plates.

Write For Particulars

GEO. T. SCHMIDT, Inc. 1806 Belle Plaine Ave., Chicago, III. then repeated until the hooks are even with the surface of the belt. T best results are obtained by using hoo of the proper size for the thickness the belt.

For vise lacing, the belt is inserted t



Using the "Safety" Tu-Way Belt Lacer

tween the jaws and against the mag zine as described above and the lacer then inserted between the jaws of t vise. The jaws are now tightened un

the hooks are properly imbedded.

This lacer is light, compact and such simple design that it can easily carried about the plant—or away from the plant if necessary. It will easily into an average tool kit and will neith take up much room nor add much the weight of the kit.

Sunnen Junior Cylinder Hone

Introduced several years ago by t Sunnen Products Company, St. Lou Mo., for cylinder grinding work on A

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It turns with the work Eliminates friction of dead

Lowest possible overhang prevents vibration and chatter.

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STURDIMATIC TOOL COMPANY

IE MAKING MACHINES By OLIVER of ADRIAN

Save 50% to 60%

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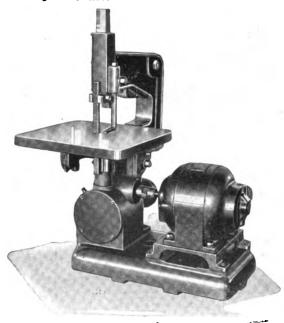
ore than ten thousand users attest to the high grade performance of ese machines on sawing and filing operations and NO TOOL ROOM, ARGE OR SMALL, can afford to operate without the services of an LIVER-of-ADRIAN die making machine.

eir use permits less illed mechanics ork assured on time al savings—GREAT-PRODUCTION PER

t us tell you more out the savings posole with an Oliver and for 12 page bookon. There's no obliga-

n.

or materials up to 3" ck).



Cut illustrates S-1 for 1" materials.

LIVER INSTRUMENT COMPANY, ADRIAN, MICH.

Sunnon

Junior

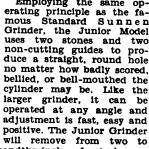
Cylinder

Hone

stins, ice machinery, outboard motors, light plants, compressors and other motors with small-bore cylinders, the Sun-

nen Junior Cylinder Grinder is proving an exceptionally handy piece of shop equip-ment for use on the Ford V-8 "60" motor blocks and other motor cylinders of similar size.

Employing the same operating principle as the fa-mous Standard Sunnen Grinder, the Junior Model uses two stones and two non-cutting guides to produce a straight, round hole no matter how badly scored, bellied, or bell-mouthed the cylinder may be. Like the larger grinder, it can be operated at any angle and adjustment is fast, easy and positive. The Junior Grinder



three thousandths-inch of stock per minute with a guaranteed accuracy of half a thouandths of an inch. Stones can be changed from roughing to finishing in thirty seconds.



"Pretty Neat" Drawing Board

"Pretty Neat" Drawing Board

For the use of plant executives may wish to make drawings at the desks, or of engineers who may wish make sketches on the job, H. E. Two ley, 7154 Magnolia Ave., Riverside, C has brought out a drawing board wh weighs less than one pound and is o 1/4 in. thick. Although compact, board is extremely efficient, simple



Meets all requirements for cutting IRREGULAR SHAPES—standard equipment furnished for ring and circle cutting. . absolutely accourate and easily operated... metal is sheared and not punched... cut anywhere, no starting holes required for inside cutting... only one adjustment for various thicknesses of material used... unobstructed cutting vision... no further finishing required. No special cutters, pilots, templates, or strippers are needed... long life shear blades. Write for complete information. formation.

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OLIVER MACHINERY CO. GRAND RAPIDS, MICH.



WALKER-TURNER Engineered POWER TOOLS

use and complete in detail, requiring no thumb tacks or T-square. The board is made of composition and is perfectly smooth on the surface. A raised edge, $\frac{1}{8}$ in. high and $\frac{3}{4}$ in. wide, provides a square surface against which a triangle can be located for drawing the vertical and horizontal lines. An 8-in. 45x45 deg. triangle is recommended, although other sizes will be found satisfactory.

Necessity for thumb tacks is eliminated by the use of spring clamps in the corners which can be raised by means of push buttons on the underside of the board and which will hold the paper

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This is one way to count

production of pieces. A much more reliable and time-saving way is to make your machines count as they produce by putting Durant Productimeters on them. We have counters for any type of metal working machine and any field of industry.

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firmly in position. The board is sligh over 81/2 x11 in. inside the raised sid thus it will take paper of ordinary stal ard stationery size. The board is, he ever, also available in 9x12-in, and 15-in, sizes.

Goulds Vertical Centrifugal **Coolant Pump**

Goulds Pumps Incorporated, Sen Falls, N. Y., has brought out a sm compact, vertical submerged type centi

pump ugal designed especially for the circulation of coolant, cutting compounds, or similar liquids containing abras_ ives in suspension. The pump is built only in the %-in. size and is designed to occupy the minimum of space in installation.

The impeller is open, double suction type, hydraulically balanced to eliminate end thrust. The impeller is mounted directly large diameter extended motor shaft, eliminating necessity of any lower pump



Goulds Vertical C trifugal Coolant Pu

bearing. The pump casing is cast inte ral with the motor support, at the t of which the motor is held in position with male and female lock to assu permanent alignment. The clearance b tween the impeller and casing is suf cient to remove the possibility of bin

-does a better job!

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BLOWER—SUCTION CLEANER—SPRAYER

No type of cleaning compares with blowing or suction for speed—economy—thoroughness—safety or versatility. No portable blower compares with the Clements-Cadillac for efficiency and long life. See it at Booth 242, Chicago Power Show.

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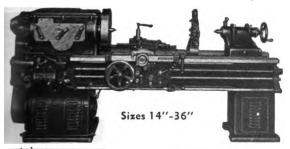
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SPEED - ACCURACY - SIMPLICITY



Step up production with 12-speed sliding gear-head lathes. Outstanding features:

12 speeds through spur tooth gears. Automatic lubrication in headstock, apron, carriage cross slide, and carriage bearings on the bed ways. Anti - friction bearings throughout.

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'Lathes and Milling Machines

SIDNE

ing from chips. There are no pockets in the casing in which chips may collect. The pump is made in capacities up to 30 gal. per minute and heads up to 19 ft. The motor is ¼ h.p., 1750 r.p.m.

Pioneer Vertical Bracket Coolant Pump

A new model pump known as the "VB" has just been brought out by the Pioneer Engineering & Manufacturing Company, 31 Melbourne Ave., Detroit, Mich., for use in handling coolant or

INEXPENSIVE QUALITY!



These new
STANDARD
Grinders provide
quality at low
cost.

Bench Pedestal
1 H.P. 10"x1"
\$102.00 \$128.00
2 H.P. 12"x2"
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3 H.P. 14"x2½"

\$215.00 \$245.00 Complete with grinding wheels

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THE STANDARD ELECTRICAL TOOL CO. 8th & Evans Sts. Cincinnati, Ohio 1912—25 Years Service to Industry—1937



Pioneer Vertical Bracket Coolant Pump

lubricant for machine tools. It is a compact, self-contained unit that bolts directly to the side of the machine base or coolant reservoir.

The pump requires no suction piping. The intake is directly through the base bracket. Its general construction and installation makes the entire unit readily accessible. It is simple to install and easy to remove. The whole unit may be dismounted simply by removing the set of flange bolts. The pump itself is likewise accessible for either inspection or servicing.

As will be noted from the accompanying illustration, the pump itself is mounted directly on the end of the motor. There is no long shaft to whip, vibrate, or cause trouble. It is a close coupled unit which maintains its high initial efficiency for an unusually long service period.



GREENERD

Arbor Presses

500 lbs. to 35 tons pressure

HYDRAULIC, MOTOR DRIVEN, HAND OPERATED Greenerd Arbor Press Co., Nashua, N. H.



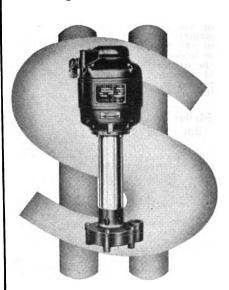




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Pumps and Profits



RUTHMAN Pumps are YOUR Profits

When you install a Ruthman "Gusher" Coolant Pump you can be sure of maximum service with minimum up-keep—for these reasons:

Low power consumption—elimination of packing glands—automatic priming feature—use of centrifugal force. These features and many more make RUTHMAN "Gusher" Pumps economical necessities for your shop.

Ruthman offers a pump for every typa of machine tool built—designed to meet every modern cutting need.

Write for free data sheets.



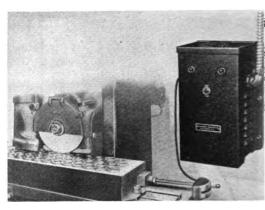
Although it will be used largely for coolant supply, the liquid handled by this unit does not have to have lubricating properties. Any type of liquid not too highly corrosive or viscuous may be pumped. Another advantage of the use of this unit is that no relief or by-pass valves are needed in the delivery line. Any degree of throttling may be accomplished without increasing the load on the motor.

Mellaphone Rectifier Produces DC Current for Magnetic Chuck

To meet the need for a simple and dependable current source in the tool room, the Mellaphone Corporation, Rochester, N. Y., has brought out

an electronic rectifier using a mercury vapor tube. This rectifier is easily installed, requiring only connections from an AC line and a cord from the chuck switch.

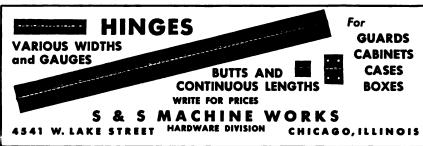
There are no moving parts to wear out and the use of the well known mercury vapor rectifier tube assures long trouble-



Mellaphone Rectifier which Transforms Alternating Current to Direct Current for Operation of Magnetic Chuck

free life. Dust, grit and moisture can not affect it. The high efficiency and simple construction which is characteristic of all electronic rectifiers accounts for the low first cost and operation. A standard full-wave circuit is used.

This rectifier can be supplied to work from either 110 or 220 volts AC and de-



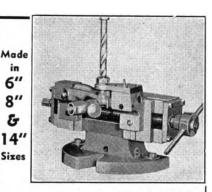




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14" JIG ILLUSTRATED

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Use De Sta Co quick acting toggle clamps for holding production parts where rapid, accurate locating and release is required as for welding, drilling, machining or assembly operations. Slight movement of handle firmly clamps the part under pressure— an easy pull quickly raises clamping bar clear of work. Operates quickly and holds firmly without slippage or side sway. DETROIT STAMPING CO. DETROIT, MICHIGAN 3449 FORT ST., WEST Twenty-four standard styles and sizes to select from, all moder-ately priced. Send for literature.

liver 110 or 220 volts DC to the magnetic chuck. The model pictured here operates on 110 volts AC with a capacity of 220 watts output.

Stevens No. 1 Adjustable Angle Tilting Table

John B. Stevens, Inc., 306 Hudson St., New York, N. Y., have brought out an adjustable angle tilting table to meet the demand for a tilting fixture for use in connection with either of the two types of 7½-in. rotary tables made by this firm, as well as for mounting vises



Danly All-Steel Sets
Danly Commercial Sets
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8 Danly Warehouses Provide 24-Hour Service for 85% of All Metal Fabricating Plants

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DANLY DIE MAKERS'

or other holding fixtures for adjustable angle machining.

The top or swiveling section of the fixture can be swung by means of a rack



Stevens No. 1 Adjustable Angle Tilting Table

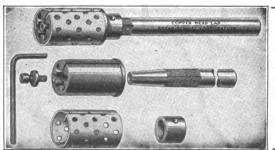
and pinion and readily bound at any point between a vertical and horizontal position. A %-in. keyway runs lengthwise of the top surface. Care has been taken in the design to keep the height at a minimum, and to make every part thoroughly substantial.

The size of the top section is 6½x10 in., and the height in a horizontal position is 6½ in. The height to the top of the 7½-in. rotary table when mounted is 9 13/16 in. Net weight, 57 lbs. Net weight with rotary table, 94 pounds.

Kling Grinder Has Wheel Wear Compensator

The Type "AT" Grinder which has been brought out by Kling Bros. Engineering Works, 1301 N. Kostner Ave., Chlcago, introduces the Wheel Wear Compensator.

By turning a handle, the wheel speed is increased, making it possible to maintain an approximate peripheral speed



LOWER YOUR LAPPING COSTS

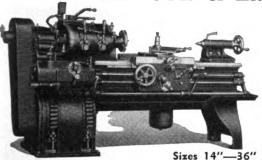
With Copper Head Expansion Laps. Profitably used in hundreds of leading shops. Available in sizes from V_0 to $2\,V_2$ ", graduated by sixteenths of an inch.

Many other designs for special applications.

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2120 Walnut Street, Chicago, Ill.

UNFALTERING PERFORMANCE IN BOYE & EMMES LATHES



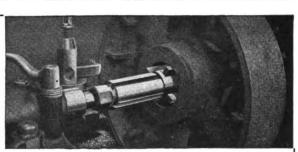
Under steady, severe usage BOYE & EMMES LATHES perform with unfaltering, unchanging accuracy, smoothness and power. Finest materials, skilled workmanship and advanced design based on 41 years of lathe building experience make this possible. Write for information on "dependable" BOYE & EMMES LATHES.

THE BOYE & EMMES MACHINE TOOL CO.

"The Lathe With The Longer Life"

With NICHOLSON EXPANDING MANDRELS

you have available for immediate use internal chucks for holding any hurry-up break-down job that comes along. Can be used on lathes, grinders, shapers or millers. Take any bore—½" to 7". Made in fourteen sizes. Bulletin 530.



3 and 4-Way CONTROL VALVES for operating single or double acting air, steam, water or oil cylinders. Made in lever, foot, solenoid and motor operated. All pressures up to 3000 lbs. Bulletins on request.

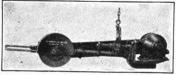


Other Products: Arbor Presses, Flexible Couplings, Steel and Stainless Ball Floats, Steam
Traps and Separators, Air Separators, Traps and Vents, etc.

W.H.NICHOLSON & CO. 136 OREGON STREET, WILKES-BARRE, PENNA.



MUMMERT-DIXON SWING FRAME GRINDERS



Sizes 14", 16", 18", 20" and 24" wheels ASK FOR DESORIPTIVE CIRCULAR MUMMERT-DIXON CO. 120 Philadelphia St. Hanover, Pa.

Why Use A Shaper to cut Keyways when a DAVIS KEYSEATER will do the job so much quicker and better?

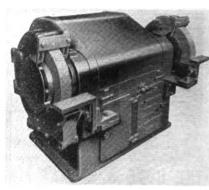
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DAVIS KEYSEATER CO.

Exchange & Glasgow Sts.

ROCHESTER, N. Y.

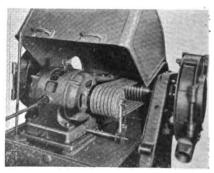
of 8500 surface feet per minute overcoming the production drop-off in cleaning and snagging operation because of wheel wear. As a safety factor, a lever mechanism between the spark guards and the compensator prevents "worn



Kling Type AT High Speed Heavy Duty Grinder

wheel speeds" with new wheels as the speed must be reduced before guard can be raised to install a new wheel.

Handy pushbutton on front of base actuates a magnetic switch inside. Motor shaft is mounted on same plane as wheel shaft to reduce vibration. Shaft



Showing Wheel Wear Compensator en Kling Grinder

is split for easy replacement of belts, and is securely held together by a heavy coupling.

Vari-Pitch Texrope Sheaves with 7 belts provides non-slip drive. Motor has tension adjustment in base. Large supporting bearings close to wheel

STAMPINGS



Experience is the essence of manufacturing. We have over 20 years experience and a modern plant to do all types of specialty stamping and die making.

Send sample or blueprints for estimate to Dept. 1.

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Improved
Anderson
Balancing
Ways

They are made in the following sizes:

Ways
No Leveling
Required
A simple
and excellent
device for
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straightening
and trueing.

Swing	Greatest Distance Between Standards	Capacity in lbs.	
20 in.	20 in.	1,000	
40 in.	30 in.	2,000	
60 in.	30 in.	2,000	
72 in.	66 in.	5,000	
96 in.	88 in.	10,000	



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Made ANGERSON Bros. Mfg.Co.

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SENSATIONAL NEW DEVELOPMENT EVANS REAMERS SURPASS ALL. HIGH SPEED STEEL.

No Honing. Chrome Like Finish.

50 to 80 thousandths expansion.
Full Bearing Surface.
Perfect Alignment.
Will not chatter.
With Left and Right Spirals.
It can not fall in slots or oil grooves. Extension Pilots for Line-up Work.

3-SPEED REAMER DRIVE



EVANS REAMING SHOP

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FLEXIBLE REAMER CORP.

3656 Lincoln Ave., Chicago, III.

chucks insure maximum bearing life. Smooth "streamlined" exterior eliminates all unnecessary angles where particles may lodge. A special work rest with pedal control is available with the Type "AT" for production grinding.

It is claimed by the manufacturer that, because of the Wheel Wear Compensator, production can be greatly increased on the snagging and high speed grinding work as the controlling of wheel speeds as they become worn is simply a matter of turning a conveniently located handle.

Literature is available on the new

Miller Dual Control Welder

office given above.

An A. C. Welder with separate voltage and amperage controls, enabling the operator to select the most desirable voltage for the amperage used on any

device from the makers at their Chicago



Miller Dual Control Welder

job, has just been put on the market by Miller Electric Manufacturing Co., Appleton, Wisconsin. This welder, known as "Dual Control" furnishes practically unlimited current settings. It is easy to operate; the three dials on the front of the cabinet are plainly marked, and it is compactly built but heavily constructed for hard usage.

Built in three sizes with a current range from 10 amperes to maximum output that makes possible welding of sheet metal or heavy metal, this welder is

TRUMORE DIAMOND TOOLS

(PATENTED)

Our finned and grooved tool saves the diamond from overheating.

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Easy and Economical with Flynn Micrometer **Boring Heads**

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COMPANY MFG. YNN 437 Bates St., Detroit, Mich.

ELIMINATE SPECIAL AND COSTLY JIG FIXTURES

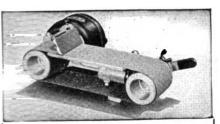
By Using Yost Drill Press Vises

They are heavily constructed and very compact. Three flanges on the base permit easy attachment to machine or drill press table. A """ shaped slot milled in the movable law permits a positive locking of vertical work. The ease and simplicity in operating makes this tool an indispensable factor in the execution of drill press operations.

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An Inexpensive ABRASIVE BAND GRINDER

"Built Like a Machine Tool"

The Hormel-M Grinder is sturdily built with a supporting leg under the grinding table to climinate vibration and tipping due to pressure on the belt. Ball bearing throughout. Equipped with ALEMITE LUBRICATION complete with grease gun.

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LOW COST Production



Complete line of automatic riveters for setting up to 4 rivets at a time.

-THE RESULT OF ENGINEERING SERVICE

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Chicago



ONE OF THE WORLD'S LARGEST MANUFACTURERS EQUIPMENT RIVETING RIVETS AND



equipped with wheels and a handle so that it is as portable as a truck. All three sizes have the same cabinet dimensions and vary in weight from 235 lbs. to 350 lbs., furnished standard for 220 volts.

Reeves Improved Vari-Speed Motor Pulley, Countershaft Type

Reeves Pulley Co., Columbus, Ind., manufacturer of Reeves variable speed control equipment, has developed a new and improved design of the Vari-Speed Motor Pulley countershaft type.



1825 So. 52nd Ave., Chicago, Ill.





Reeves Improved Vari-Speed Motor Pulley. Center Shaft Type

The Vari-Speed Motor Pulley is a simple, conpact variable speed unit which is mounted on the standard shaft extension of any constant speed motor. It forms direct drive from motor to driven machine. Through handwheel control, a sliding base on which motor and unit are mounted is moved forward or back, varying the diameters of a set of adjustable discs from which a V-belt runs to the driven machine. Desired speed changes are made as the belt runs from maximum to minimum disc diameters.

For requirements of either unusual speed reduction or speed increase, a countershaft is mounted on a common base with the rest of the unit. In the design illustrated, this pulley may be mounted in the center of the countershaft, between the two bearing housings, thus providing a compact, spacesaving unit in installations where this factor is important.





Remove | Broken | Taps!

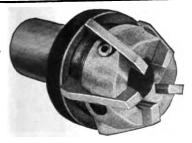
Easily— Quickly— Without Injury To the Threads

The Walton Tap Extractor is a derice for removing taps broken at or below the surface of the work — easily — quickly — and without injury to the threads.

Made in 2, 3, and 4 fluted styles in all standard sizes from No. 4 to 1 ½ inch.

Let us prove its value to you by a 60-day free trial.

The Walton Co.
98 ALLYN STREET
HARTFORD, CONN.



GENESEE ADJUSTABLE HOLLOW MILLS

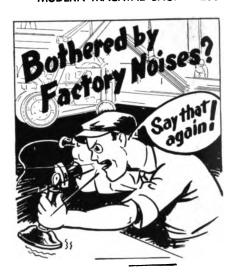
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SEVEN DIFFERENT STYLES

Have Genesee cut your costs. We design and manufacture hundreds of special and multiple operation production tools. Send samples or blueprints now.

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GENESEE MFG. CO., Inc. 141 No. Water St., Rochester, N. Y.



Phone in Quiet in the New Acousti-Booth

You can telephone in the noisiest factory without interference by using the Burgess Acousti-Booth. The clatter and roar of near-by machinery is completely absorbed. Yet this new type of telephone booth has



no door and is open at the bottom. The secret of the Acousti-Booth's amazing quietness lies in its patented acoustic lining, consisting of a combination of perforated metal facing backed by an efficient sound absorbing material. The booth is convenient to use and is never stuffy. As it is of rugged allsteel construction, it will withstand the roughest service. Mail the coupon.

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Ples	se send Bulletin 126 and details ial 10-day trial offer.	o f
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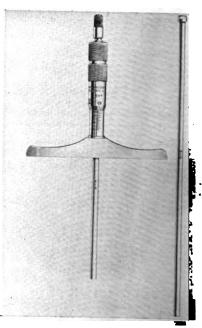




While a straight-face pulley is illustrated, power take-off may also be from sprocket, pinion, multiple V-belt, sheare or any other accepted drive. The countershaft supports are extremely strong, rigid and heavily braced so there is no possible chance of vibration or twisting in the countershaft. The Reeves Vari-Speed Motor Pulley is built in seven sizes, transmitting from fractional to 7½ h.p., and covering speed ratios of 3:1.

Brown & Sharpe No. 607 Micrometer Depth Gage

A micrometer depth gage has been made available by Brown & Sharpe Mig. Co., Providence, R. I., in a new size



Brown & Sharpe No. 607 Micrometer Depth Gage

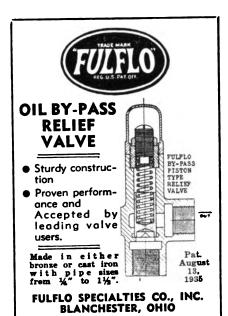
measuring from 3 to 9 in. in depth. The micrometer screw has a movement of 1 in. and the range of 3 to 9 in. is obtained by the use of six measuring rods. The measuring rods are of ample rigidity, being 3/16 in. in diameter. The ends of the rods are hardened.

The base is approximately 9/16 in. thick. 4 in. wide, and hardened. The



WHEEL TRUEING TOOL CO., INC.

curate.





desired rod is easily and quickly inserted in the gage through a hole in the micrometer screw. The positive setting arrangement for the interchangeable measuring rods comprises a desirable feature of this gage. The design also makes it possible for the gage to be furnished with a ratchet stop.

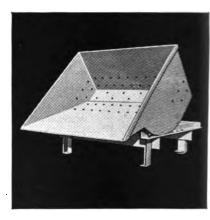
Roura Dump Hopper

A new dump hopper, for use in connection with hand or power lift trucks, for handling raw materials, parts, waste or finished products, and designed espe-





cially for loads that are hot and for service in departments where the equipment is subjected to high heats, has



Roura Dump Hopper

been brought out by Roura Iron Works, Detroit, Michigan.

The hopper is arranged for side dump and is also furnished for end dumping. Special alloy steel is used in its fabrication and sides and bottom are perforated, both precautions being taken to enable the hopper to resist warping. The hopper is furnished on legs or casters with any specified underclearance, and has one yard capacity. It is equipped with a single latch which holds the load securely in position and when unlatched. enables the hopper emptied promptly and cleanly.

Ryerson Announces Certified Steel Plan

Joseph T. Ryerson & Son, Inc., Chicago, Ill., has announced a new, unique plan to aid steel users in securing more uniform and satisfactory results from their steel. The system, to be known as the "Ryerson Certified Steel Plan", undertakes to select entire heats of alloy steels that have particularly desirable qualities and come within certain narrow analysis limits, make thorough tests for chemical and heat treat characteristics, and prepare complete data concerning the analysis, tests, and so on, for delivery to the customer who buys the steel. The plan is of particular value on the alloy steels that usually require heat treatment before use, and will solve many of the problems that

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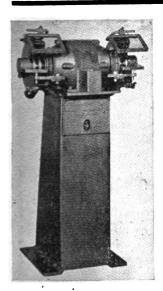
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HP	Speed	Wheel Size	Price
2	1800	12"x11/4"	\$158
3	1800	12"x2"	\$168
4	1800	14"x2"	\$210

Reduce your grinding expenses by locating these machines close to your high-priced operators.

THE PRODUCTION EQUIPMENT CO.

JOSEPH T. RYERSON & SON, Inc.

S. A. E. Type...4615-20

Heat Symbol L. H.

HEAT ANALYSIS

C. 16 Mn. 152 Phos. 1018 S. 1936 St. 127 Ni. 1494 Cr. Mo. 189 Va. Inherent Orain Size 5-8 Inclusions - American

CARBURIZING CHARACTERISTICS OF THIS HEAT

1" Round Carburized 6 Hours at 1700 Deg. F. Cooled in Pot. Reheated to .. 1475 .. 'F. Ouenched in .. 911 ...

Physicals Depth......039. Inches.

	Tensile Strength	119,000	Lbs. Per 8g. Inch
_	Yield Point	91,000	Lbs. Per Sq. Inch
Core Physicals	Elongation	21	% in 2 inches
	Reduction of Area	60	%
	Brinell Hardness	348	

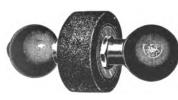
yerson Certified Alloy Steel Data Sheet for the case carburizing teels. These data sheets are made up on every heat of steel laced in stock. When carburising steel is ordered, one of these data sheets is sent to the customer.

ave developed with the increase in the se of alloys.

The Society of Automotive Engineers as compiled a set of specifications covering the great majority of alloy steels in use today. In compiling these specifications, the engineers have worked with the steel producers and have narrowed the limits of composition as far as it is practical for the steel manufacturers to follow. The limits are relatively wide however. and therefore steel ordered only by S.A.E. specifications may vary greatly in heat treatment response from one heat to another. This response depends partly on analysis and partly on the general hardening characteristics of the particular heat in question, these characteristics being governed by the structure of the steel, inherent grain size, and so on. The variation frequently results in uniform results and the extra expense of retreatment.

When large tonnages are involved, a user can purchase whole heats and it is then practical for him to analyze each heat and test it for heat treatment response. In this way he is able to control his heat treatment process so as to offset any differences between heats. When average lots of alloy are

purchased from stock, however, the customer can hardly afford to run analyses and heat treatment tests on the differerent bars. Therefore, the only solu-



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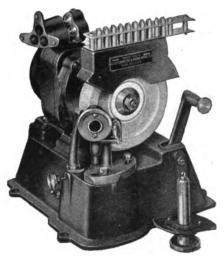
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tion is to serve him with alloy steel that has already been analyzed and tested before he gets it. Ryerson has been seeking to solve this problem for many years.

To accomplish the desired result Ryerson had two fundamental problems to overcome. first was to secure standard alloy steels for stock which conformed to an analysis range closer than S.A.E. specifications and which were closely controlled in general hardening characteristics. The second problem was to develop a method of informing each customer of the complete analysis and heat treatment characteristic of each bar shipped to him.

The first problem was solved by specifying, for all their alloy steels, a much closer chemical analysis basis than the standard S.A.E. specifications and including in these specifications factors governing the heat treat responsiveness each type of steel. Only the heats are selected which come within this restricted range, and are then identified by letter symbols and later rolled into bars bearing the same letters. Identification letters are stamped on the end of each bar and in the case of small

bars the bundles are tagged. Thus all bars produced from a given heat carry

JOSEPH T. RYERSON & SON, Inc.

S. A. E. Type 3135-40

Heat Symbol A.M.

HEAT ANALYSIS

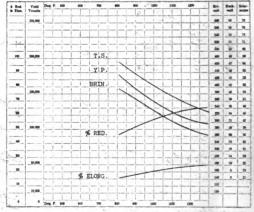
C. 38 Mn. 78 Phos. 018 S. 021 St. 23 Ni 1.35 Cr. .69 Mo...

Inherent Grain Size... 6-7 Inclusions - (Automotive Cl.

Oxides 4

HARDENING CHARACTERISTICS

1" Round Quenched in OIL at 1525 "F. Drawn as Shown Below.



This chart shows actual analysis reported by the mill on the heat indicated by symbol letters. It also shows physical properties developed by heat treatment test on 1st round sample of this heat. The data shown will vary from one part of the heat to another due to permissible segregation and normal variation of analysis determinations.

This information is given for the guidance of our customers in determining the best heat treatment for this steel, but it will not be accepted as a basis for rejection of quaerial nor establishment of claim. Do not neglect to consider effect of man on the results developed by heat treatment.

Ryerson Certified Alloy Steel Data Sheet for the higher alloys that are hardened by quenching. One of these data sheets, covering the particular steel shipped, is sent to the customer. It gives him information upon which he can predicate heat treatment results without making tests, and so on.

Thus all the identification letters assigned to that eat carry heat. The only problem remaining was



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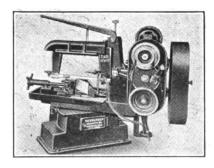
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to transfer the accumulated information about the steel to the customer.

In order to condense the information regarding these special heats, Ryerson revised two types of charts, one for carburizing (case hardening) steels, and the other for steels of higher hardening characteristics which are heat treated by quenching. These charts, in the case of the carburizing steels, give the heat analysis identification letter, Mc-Quaid Ehn grain size, cleanliness rating, and also the results of a carburizing test of a standard sample. This





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All Ryerson Certified Alloy Bars are identified by heat symbol letters stamp the end of the bar. The same symborepeated on the Ryerson Certified Allege Data Sheets which are sent to the case

shows the hardness of the case, the effective depth of the case and the physical characteristics of the core.

In the case of the quenching steel the analysis, identification letters, Mc Quaid Ehn grain size, and cleanlines rating is shown, together with curve representing the tensile strength, yield point, elongation, reduction of area Brinell hardness, and so on, as devel oped by test specimens quenched at suitable temperature for the analysi and drawn to various temperatures. Thus the heat treater has complete information on the particular steel with which he is dealing as well as a record for his file as to the composition of the steel used in every job which has gone throughlis shop.

In summarizing the plan, the followin



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ARCH TYPE

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outstanding points are found:

No. 1, Warehouse stocks of alloy steels are now available which have been selected to meet specifications much closer than the standard S. A. E. ranges and which are accurately controlled in regard to grain size and other hardening characteristics.

No. 2. All bars except very small diameters are identified by letter symbols stamped into the ends of the bars.

Small bars are tagged.

No. 3. All bars have been metallurgically tested and the results of these tests, covering both chemical analysis and heat treatment response, have been tabulated on similarly identified data sheets.

No. 4. When a shipment is made to a user, a data sheet for the bars shipped is placed in his hands in sufficient time so that it can be transferred to the heat treating department before that department is called upon to subject the steel to heat treatment.

No. 5. The plan simplifies the heat treating department's problem because they know exactly what material they have to work with and have been informed ahead of time as to how it will respond to heat treatment. The purchasing department's problem is made easier because satisfactory steels can be duplicated. The production department is helped because there are no delays due to trouble in heat treating.

The Ryerson Company has prepared a book describing the plan and its advantages in detail and a copy is avail-

able to steel users upon request.

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A line of centrifugal pumps designed for pumping coolant, water, oil, or other fluids, has been developed by Logans-port Machine, Inc., Logansport, Ind. The

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pump is made in nine models, to deliver from 4 to 150 gal. per minute. The pump operates in a vertical position, and since side-wall mounting frequently proves most satisfactory from the point of convenience and accessibility, the vertical mounting base bracket is optional on all models.

The Logan pump is self-priming under all normal applications; thus it is not necessary to submerge any part of the pump in the liquid. No foot or check valves are required in the intake line except in extreme installations approaching maximum lift where the capacity of the line may exceed that of the pump reservoir. Therefore the pump may be located at any convenient point near the



Logan Sure Flow Centrifugal Pump

operation, with the tank also located for greatest convenience and space savings.
The Logan pump will handle practi-

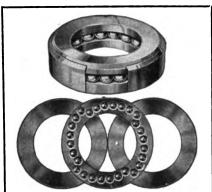
cally any type liquid. There are no metal-to-metal contacts and no close clearances are exposed. Bearing surfaces are protected by rotary seals, therefore the pump will safely pump liquids charged with abrasives, filings, most corrosive impurities, and even solids within reasonable limits. The pumped liquid is delivered at the point of application im-

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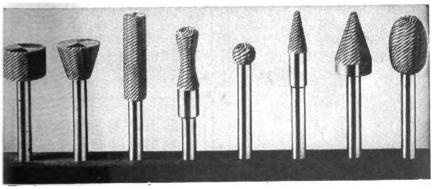
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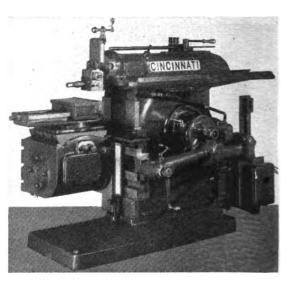
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mediately; i.e., at the instant of starting the operation.

The Logan pump is available with direct motor drive, belt drive, or adapter for direct power take-off. adapter model generally lends itself readily to special application, either as placement or original equip-Flat or V-type pulleys are optional on all belt driven models. The Logan engineering department will cooperate in the design of special bases or special adaptations of the pump.

Cincinnati High Speed Shaper

The Cincinnati Shaper Company, Cincinnati, Ohio, has added a high speed Shaper to their line of Rapid Traverse, Universal, and Utility Shapers. This Shaper, illustrated herewith, differs little in appearance from



Cincinnati High Speed Shaper



GRAND RAPIDS, MICH.



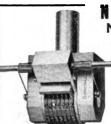
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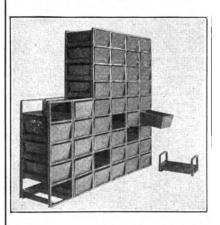
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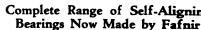
The rocker arm and link are of aluminum alloy to reduce the weight of reciprocating parts and to insure smooth reversals at 200 strokes a minute. The ways for the sliding block are cast iron and provide excellent bearing conditions in combination with the steel gib.

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The advantage of this tool, of cour is the 16-in. heavy duty capacity cobined with high speed operation. The 200 strokes a minute meet all demar of practicable high production requiments. The 4500 pounds weight, the 16-in. stroke, the generous work spatable travel, light capacity, and rigid a and column insure greater usefulne accuracy, and long life.



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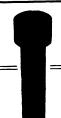
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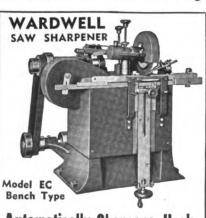
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Morse Silent Chain Engineering Data The Morse Chain Company, Book. Ithaca, N. Y., announces the Morse 1937 Silent Chain Engineering Data Book. In this 20-page booklet has been gathered detailed information that plant engineers and production men most frequently require in plan and specifications for silent chain drives.

A partial list of the new book's contents include horsepower tables, explanation of the different types of Morse Silent Chains and their applications. layouts of typical shoes and idlers. sprocket data, directions for cutting sprockets, how to calculate chain length, special sprockets and their uses, chain cases and methods of oiling. It is profusely illustrated with photographs, de-

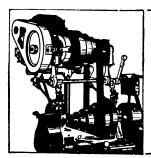
tailed drawings, and special graphs.

This booklet is offered free upon request to everyone who wishes to make

use of the data it contains.

Jarvis Catalog M. S. T. of Flexible Shaft Driven Power Tools. The com-plete line of Biax and Jarvis Flexible Shaft Machines, together with accessory shart machines, together with accessory equipment and tools, are presented in a 28-page catalog, 8½x11 in. in size, now being distributed by The Charles L. Jarvis Company, Middletown, Conn. Included in the equipment are the Multi-Biax bench type, floor type, overhead trolley type, and overhead saddle type flexible shaft machines, Supra-Biax rol-ler floor and overhead types, and the Jarvis Vario-Flex machines, single speed machines, Jarvis screw and nut setters, and Jarvis screw drivers. Jarvis selfcontained shafts for your own motor are also included.

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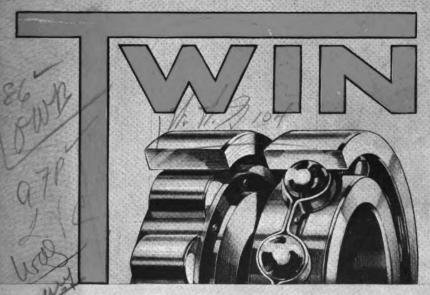
Dart Union Cat alog. Complete data on Dart pipe union and fittings i given in the nev catalog just pub lished by the E. M Dart Manufacturin Dart Company, R. I. Providence, R. Ful information 01 sizes. and prices included is with color illustrashowing the distinctive full-bearing, true ballconstruction In addition to tables giving dimensions the catalog describes the precision operations, materials, and methods of inspec-tion used in the manufacture of Dart Unions.

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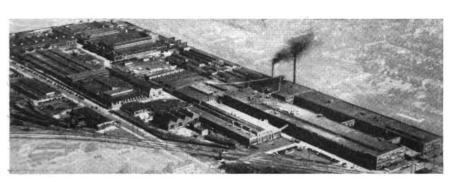
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Machine Shop

CINCINNATI, OHIO

October, 1937

Vol. 10, No. 5



Production Operations on Servel Refrigerating Equipment

Well-Planned Operations and Efficient Equipment Make it Possible to Market a Quality Product at Nominal Cost.

BY HOWARD CAMPBELL

ECHANICAL refrigeration, originally regarded as a luxury, is fast becoming an important necessity in every-day life. The small units which were developed to provide an individual ice-plant for each householder have been adapted to the cooling of building interiors and no modern store, theatre, or office building

is considered properly equipped unless it is air-conditioned. The possibility of air conditioning is considered in all the newest designs for dwellings, and the architect draws his plans accordingly.

This development and rapid growth in the use of mechanical refrigeration can be credited to the "machine age"—to the precision production equipment which makes it possible to work to a ten-thousandth of an inch

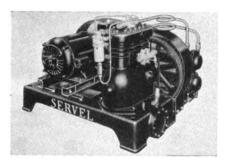


Fig. 1—Servel Air Conditioning Unit, made in sizes 1/6 to 1/20 h.p.

while producing parts at a high rate of speed and thus reducing the cost to a point low enough to make mechanical refrigeration a commercial possibility.

Among the plants which are outstanding for their careful engineering and fine workmanship on refrigerating units is the plant of Servel, Inc., at Evansville, Indiana. This article presents some of the more interesting operations in the building of Servel Refrigerating Units. A Servel unit of the smaller type is shown in Fig. 1.

The illustration Fig. 2 shows the finishing of both sides of the base plate for a compressor unit. While not particularly a "precision" operation, this operation illustrates the point of "speed" in manufacturing. Only enough

stock is removed to finish the surface—usually approximately 1/64 in.—and the operation is performed on a diamond grinder. The piece is held on a magnetic chuck which is set vertically, as shown. No clamps are necessary; thus the piece can be chucked, finished, and removed at a

rate of approximately 60 pieces per hour.

The crankcase, in which the cylinder bores are located, is machined on top and bottom first by milling, after which these surfaces are finished by grinding in the Blanchard surface grinder shown in Fig. 3. Sixteen pieces are finished at a time, held on a magnetic chuck as shown, and approximately 0.015 in. of stock is removed from each surface. The time required to finish the 16 pieces is from 15 to 20 minutes and the dimension from the top to the bottom of the piece is held within 0.002 inch.

Pistons are ground in the same manner on this same machine. Some 45 different jobs are finished in this machine.

Piston holes in cylinders for one of the small size air conditioning units are drilled, bored, reamed and counterbored in the set of three Baker



Fig. 2—The base plate for the compressor unit is finished on both sides by grinding in this Diamond surface grinder. The workplece is held in position by a magnetic chuck, eliminating necessity of clamping.

vertical drilling machines illustrated in Fig. 4. The machine tables are so aligned that they can support a track upon which ride the three jigs, each of which is equipped with grooved wheels. This principle of construction makes it possible to adjust the jig back and forth so that



Fig. 3—(Above)—The top and obtom surfaces of the crankcase re finished by grinding in this Blanchard surface grinder. Fig.—(Right)—Three Baker drilling machines are kept in continuous operation, boring and reaming the piston holes in the cylinders.

both cylinder holes can be

machined.

The jigs are not moved from one spindle to another, however; instead, each piece is finished in its own machine, the tools being equipped with Magic chucks so that the tools can be changed without stopping the machines. It has been found quicker to change tools than to change machines and the operations are started and completed consecutively so

that the operator simply goes from one machine to the next changing the tools until each cylinder in turn is finished and the jigs have been reloaded with unfinished pieces.

By handling the job in the manner described above it is possible to machine three different sizes of cylinders at one time, and it is usual for two different sizes to be in process simultaneously.

After boring, the cylinders are finished to size by honing in the Hutto grinding machine shown in Fig. 5. A Hutto four-stone hone is used, all cylinders being rough honed first and then finished. The stones in the roughing hone are slightly rougher than those used in the finishing hone, and the hones are changed between operations. The cylinder shown in process is for a three-cylinder compressor. The bore on this type of cyl-

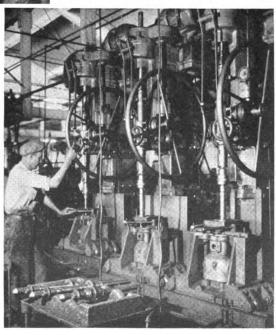




Fig. 5—Here the cylinder for a triple-cylinder air conditioning unit is being finished to size by honing in a Hutto honing machine.

inder is 2.375-in. diameter with a limit of plus or minus 0.0005 inch.

A typical example of a modern pre-

cision machine tool is illustrated in Fig. 6, where a Heald "Red Head" Bore-Matic diamond boring machine is being used to bore the crankshaft bearing holes in a compressor body. The tools are of Carboloy, and the spindles in which they are held are operating at a speed of 2810 r.p.m. Only one bearing is bored at a time, the piece being then reversed so that the other bearing can be bored. Upon the boring of the second bearing, a pilot is used to insure that the bearing holes will be in perfect alignment. From 0.012 to 0.013 in. of stock is removed from each hole, the finish diameter being held to a limit of plus or minus 0.00025 in. Production on this operation is approximately 60 pieces per hour.

Each refrigeration or air conditioning unit is powered by an individua electric motor from which the power is transmitted to the compressor by means of V-belts. The pulley upor which the V-belt operates must be machined very accurately in order to obtain the highest possible tension with the lowest possible strain between the two shafts. A pulley for an air conditioning compressor uni can be seen in Fig. 7 in process of having five belt grooves machined in it. The machine is a Warner & Swaser No. 2A turret lathe, equipped with a turret tool holder which holds several different kinds of tools for the machining of the pulley. The pulley is held in a chuck and is steadied by a bull center in the turret.

Another example of the modern equipment which makes possible extreme accuracy at high speed is the Cincinnati centerless grinding machine shown in Fig. 8. In this case, the machine is being used for the



Fig. 6—Crankshaft bearing holes in the compressor bodies are bored to size in this Heald "Bore-Matic" diamond boring machine.



Fig. 7—Turning the belt grooves in a compressor pulley.
With this Warner & Swasey turret lathe the pulley is
turned, bored and faced simultaneously.

grinding of eccentric shafts for an air conditioning compressor unit. The shafts are passed through the machine three times; in the first pass the stock is roughed down to within 0.003 in., in the second pass the shaft is finished to within 0.0005 in., and in the third pass it is finished to within plus or minus 0.0002 in. of drawing size. A mirror

finish is obtained and the shafts are finished at a rate of 50 per hour on the two roughing operations and 100 per hour on the finishing operation. All straight shafts, bushings, and other small cylindrical parts are finished by this method.

The illustration Fig. 9 shows how the "fins" are pressed into place on the tubes of the evaporator. The machine used for this operation was originally a Bausch multiple

spindle drill which has been converted into a hydraulic press. Tapered plugs are set into the upper ends of the tubes so that the fins can easily be located and forced into position. The fins on the evaporator shown in the illustration are 6x13½ in. and are of 22 gauge metal. Each fin has 21 holes to accommodate the 21%-in. copper tubes with which they are to be assembled.

The fins are spaced 5/16 in. apart, which is accomplished by means of the mechanism on the side of the press, shown in Fig. 10. Upon locating the fin the proper position over the tubes, the operator pushes a button which starts the operation cycle of the press. The

head moves down a predetermined distance and then back up again to the stopping point. As it reaches a point near the top of its cycle, however, the arm A strikes the collar B, which is anchored to the shaft C. At the upper end of shaft C is a rack which engages the teeth on a gear upon a shaft which is also the shaft for the

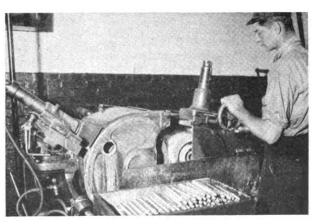


Fig. 8—Shafts are finished to size within 0.0002 in. in this Cincinnati centerless grinding machine.

bevel gear D. This bevel gear rotates a mating gear on the upper end of the shaft E, which is connected with the mechanism by which the table is

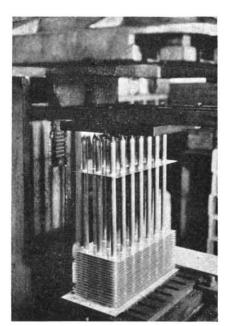


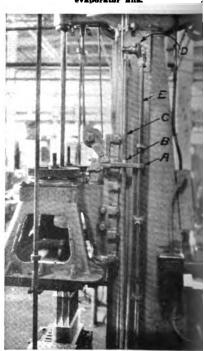
Fig. 9—Assembling the fins to the tubes of an evaporator unit. The press was rebuilt by Servel from a multiple drilling machine.

raised. Thus as shaft C is forced upward, gear D is rotated, and the motion is imparted to the vertical shaft E, resulting in a downward movement of the table. The extent to which the table is moved depends upon the setting of collar B. Thus, at each movement of the press, the table is lowered the desired distance so that a predetermined dimension is tained between the fins. All the operator has to do is to place the fin in position over the tapered plugs in the upper ends of the tubes and then depress the foot-pedal which engages the clutch and starts the operationcvcle.

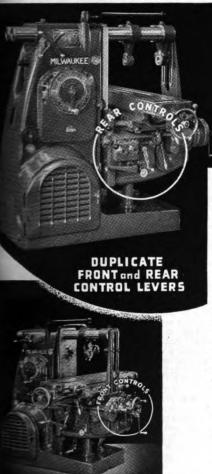
Each compressor unit is tested for leaks after assembling by attaching an air hose to the unit and immersing the unit in a tank of water. As each compressor in turn is moved along

on the roller conveyor toward water test tank, it is picked up means of an overhead air hoist, swur into position over the tank, and then lowered into the tank, as show in Fig. 11. When completely in mersed, dry air at 250 lbs. pressu is turned on and if there are leaks, the bubbles will immediate be visible. If upon careful inspection no air bubbles can be seen, the un is set back on the conveyor and passe on to be dried and finished for ship ment. If there are evidences of lead age, the unit is completely disa sembled, each individual part is the oughly inspected, and the defect remedied by repairing or by discar ing it altogether and substituting new part.

Fig. 10—This view shows the mechanism which the spacing is obtained between the



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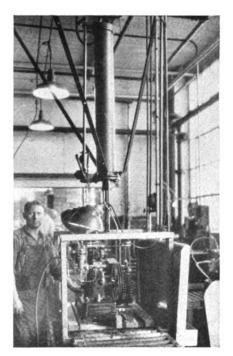


Fig. 11—Each compressor unit is tested for leaks after assembling by attaching an air hose to the unit and immersing the unit in a tank of water. No bubbles—no leaks.

No Servel unit is allowed to leave the plant until it has been "run-in" for a sufficient length of time to prove that it is built to the specifications set up by the engineering department and will function properly in everyday use.

Control of Electric Motors. By P. B. Harwood. 390 pages. 188 illustrations. John Wiley & Sons., Inc., New York, N. Y. \$4.50.

The author describes the features of motors of all types and explains how their characteristics are used for control purposes. The descriptions of apparatus cover fully the design, construction and functions of the elements making up the devices. Both direct-current and alternating-current motors are discussed and classified by types, as are the appropriate controllers used with each style. Pilot

devices and accessory switches of various kinds are covered. Brakes and methods of mounting them are treated briefly. A chapter on wiring diagrams with a list of definitions and graphical symbols with pertinent notes and examples is included. Resistors and resistor design are dealt with in full, as is the subject of the construction of control apparatus.

The book appropriately illustrates the subject matter. This volume can be of much benefit to all engineers and designers whose field of work includes the use of electrical motors for operating

and driving machinery.

Stainless Working Methods Book. A new technical publication by Ludium Steel Co., Watervliet, N. Y., entitled "The Working of Silcrome Stainless Steel." links up, in a novel way, detailed instructions on methods of fabricating Ludium Stainless with information as to to the grades of tool steel best suited to

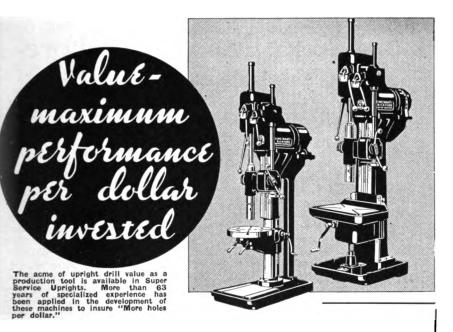
each operation. This factual data book has been prepared for the use of engineers, designers. and other technical men interested in practical working methods, to guide them in using Silcrome to greatest advantage. It contains practical advice on all the usual metal working operations, such as sawing, drilling, milling, threading, tapping; also on hot upsetting and forging, shearing, drawing, punching, spinning, brazing, soldering, welding, and the like. In addition, the book contains information on the proper selection, heat treatment, etc., of the tool steels for the various operations.

This manual, according to Ludlum, is the outgrowth of long experimentation in the laboratory, and careful study of actual production methods. This unique tying in by Ludlum of tool steel data with stainless working instructions should prove an outstanding contribution to the literature on the subject.

Copy free upon request.

Dumore No. 12 "Chief" Lathe Grinder is described and illustrated in a bulletin now being distributed by The Dumore Company, Racine, Wis. Outstanding features of the grinder are discussed and photographs show several installations of the "Chief". Copy free upon request.

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SUPER SERVICE UPRICHTS

Conference Method of Foreman Training at Crosley Radio Corporation

By J. M. BAKER
Personnel Director, Crosley Radio Corporation

OWEL CROSLEY, JR., president of the corporation which bears his name, has said "If a man cannot or will not learn to mesh in his part of the job with the organization as a unit, he simply does not belong. His ability and his experience are of no value whatever unless he knows what means to cooperate willingly." Lack of cooperation is sometimes a question of disposition or state of mind of the individual. Cooperation, on the other hand, is more likely to be a matter of knowing how, of training, and of understanding how an organization works as a unit, whether its members be spread over a manufacturing plant or over a continent.

The function of any foreman is to so supervise his department as to enable his people to do their work in the easiest and best way and to coordinate their efforts properly with related functions. This can be done after a fashion in a hit-and-miss manner, but too many inaccuracies can creep in. With this thought in mind. the Crosley Radio Corporation undertook, about a year and a half ago, a course of training for its foremen and department heads. The details of the training course were worked out with the help of the plant superintendents and in cooperation with the University of Cincinnati.

After considerable investigation as to the methods in use in other plants and other industries, it was decided that the conference method should be adopted, inasmuch as this method appeared to enlist and hold the interest of the men to a greater degree than the classroom or lecture methods. Briefly, what we aimed to do was to delineate the important features of the foreman's job and to encourage practical discussion of the foreman's supervisory, managerial, and training responsibilities. No attempt was made to present a cut-and-dried program of topics for discussion; rather, it was felt that the discussions should be based on the problems and experiences of the foremen themselves.

As finally worked out, the training course comprised 16 conferences. The meetings were conducted under the supervision of the plant Personnel Director and were held in one of the studios at the plant once a week from 4 to 6 o'clock P. M. The Personnel Director selected the leader for each conference, the plant executives taking turns in conducting the meetings.

At the first meeting it was man clear that the conference leader we not expected to lecture the force on how to do their work, but was simply act as the presiding officer cleader of the discussions. The tives of these discussions were lined as follows:

1. To develop and equip experies foremen to conduct foremanship.







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- 3. To develop and promote a better understanding and relationship between the foreman and his men, the foreman and his fellow foremen, and the foreman and his company.
- 4. To encourage analytical, constructive thinking that will help the foremen to develop scientific methods of analyzing their difficulties and solving the problems that interfere with the efficient functioning of their departments.

It was pointed out that the average foreman is promoted to his position because he is a superior worker in his own department and understands all of the operations and processes. It is possible, however, that he has had little or no training with respect to what might be called the human factor-handling workmen and "getting along with people." Consequently he is faced with a great many brand-new problems such as promoting morale, developing co-operation, restricting labor turnover, instructing new and older workers. and representing workmen as well as management.

The latter part of the first session was given over to a preliminary discussion of the responsibilities of a foreman, and the meeting closed with the assignment of three topics, under the general heading "Cooperation," for practice conferences to be conducted by three foremen who are named as leaders for the subsequent meetings.

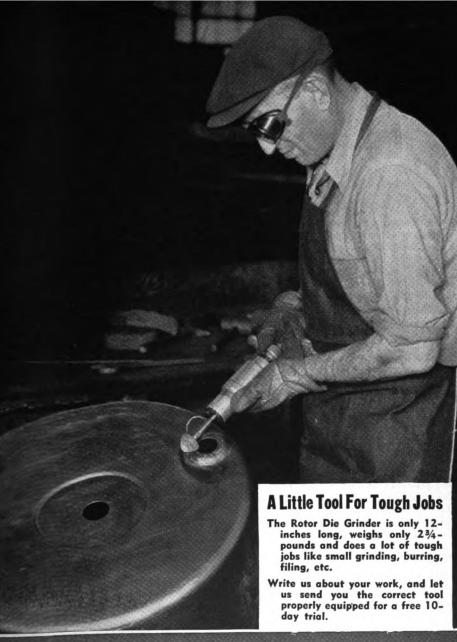
At the next meeting the conference leader reviewed the work accomplished at the first meeting. Then he presented, briefly, the types of educational procedure which could best be used by foremen, classifying the methods as informing, instructing, and conferring. Emphasis was placed on the conference method and its usefulness in helping foremen to think clearly through a problem for which there may be no standard solution.

The various steps in the development of the plan were outlined thus: preparation, securing information, selecting functioning data, evaluating functioning data, arriving at a conclusion, planning means to make the conclusion effective in practice, and carrying out the plan.

With that outline as a guide, the designated foreman was called upon to lead a conference on "Cooperation." This subject was expanded by the group under four headings: How Foremen Cooperate, Classification of Data, Evaluation, and Definition of Cooperation at Crosley's. Obviously, a general discussion on such a subject is enlightening to all. In conclusion, the conference leader reviewed; the handling of the conference by their designated foreman and made assignments for the next two meetings.

The three meetings following were devoted to a combination of the theory and technique of conference practice and the practical work of conferring on everyday matters. As an illustration, at the third session the conference leader discussed with the group two fundamental techniques in the conference procedure—objectives and questions—after which the foreman leader attempted, with the assistance of the other conferees, to analyze the causes of lack of cooperation.

These causes were listed under seven headings, each of which was amplified and developed out of the practical experience of the group: General Characteristics of People



ROTOR AIR TOOL COMPANY

Who Do Not Cooperate, Reasons Why Foremen Do Not Cooperate with Subordinates, How to Improve Cooperation with Subordinates, Reasons Why Foremen Do Not Cooperate with Other Foremen, How to Improve Cooperation Between Foremen, Reasons Why Foremen Do Not Always Cooperate with Superiors, and How To Improve Cooperation with Superiors. The group as a whole participated in the general discussion.

While a certain amount of the instruction was of the theoretical type, every effort was made to keep the meetings on a practical plane. For instance, at the fourth meeting, the conference leader presented this specific case:

A foreman, walking through his department, noticed that a belt was badly worn. He wrote a requisition for a necessary replacement and ordered a workman to make the repairs. The foreman noticed that the man was not familiar with the job, so he instructed and checked him on the work.

An analysis of this incident made by the group showed that the foreman had performed three functions: supervisory, managerial, and instructive. In his supervisory capacity he had observed the worn belt, analyzed the need for repair, and had checked the finished job. The managerial function consisted of writing a requisition for the material, selecting an available man, and assigning him to the job. As an instructor he noted the inexperience of the worker, instructed the man, and checked the finished work. This was only one of a number of similar cases which were presented for analysis and discussion.

One of the best discussions was that on the handling of difficult types of employees. Under this classification belong those employees who are dissatisfied, indifferent, radical, wasteful, troublesome, and disloyal. The confi ence centered upon methods of rea nizing these individuals and the plication of remedial measures. instance, one conference was devo to the "Radical Type of Employe the subject being divided into the £ lowing classifications for purposes discussion: Characteristics of a L cal Employee: Definition of a Ra cal Employee; Suggested Reme Measures; Suggested Remedial State In the conference devoted to the cussion of "The Wasteful Employe the discussion took up the follows topics in turn: How to Recognize Wasteful Employee: Classification 19 Points Brought the Discussion; Suggested Remedi Measures; Suggested Remedial Step

Among other practical problem taken up and discussed by the group during the remainder of the course were subjects related to accident prevention and the accident-prone work er, fire control, waste of material, reduction of scrap, selection and development of young men, human enering, a square deal for each ployee, job security, waste that the prevented by the foremen, the the functions of a foreman, how where time is wasted, and so on.

When the conference was started the group included sixty-five forement, this number being added to from time to time until the group numbered one hundred twenty-five. When it reached this size the group was divided into four groups of twenty-five to thirty men each, so that the participation could be more general.

At the close of the series it was pointed out that each foreman derived benefit from the proceedings in proportion to what he had put into them, and also that those who did not join in had had the advantage of the other fellows' ideas without contributing anything. It was noted with satisfac-



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tion that the interest of the men held throughout the course because they had chosen their own subjects for discussion and because they had drawn from their own practical experience in presenting solutions for the problems under consideration.

There is no question but that, however good the material, a foreman needs a certain amount of training for foremanship just as he needs it for any other position of leadership. The newly-appointed foreman may have been an excellent mechanic, and he may have the qualities necessary to becoming a good foreman, but it should be remembered that he had to be trained for his mechanical job, and he should have certain definite training for his job of directing and supervising the other people in his department.

There are many expert workmen who lack the peculiar qualities necessary for successful leadership, and there are many natural leaders who, for one reason or another, are not expert workmen. It is not unusual to find a man who cannot be interested in detail work and who is therefore unhappy at it, but who is excellent at planning, directing, and leading. However, it is rare that a new foreman understands what is expected of him so well that training is unnecessary. He may have pre-conceived notions regarding foremanship which are contrary to good practice, or which are not in accord with company policies; consequently he needs proper instruction before he has had an opportunity to make too many errors.

Training for leadership is definitely necessary, and the conference method appears to fill the need in a highly satisfactory manner. It is hoped that the information regarding Crosley's experience which has been presented here will be of some value to others who are considering this matter.

Firth Braze-Rite Furnace Booklet. This six-page bulletin, now being distributed by Firthite Division, Firth-Sterling Steet Company, McKeesport, Pa., describes the features and advantages of the Firth Braze-Rite Furnace for brazing sintered carbide tools. The five operations required to make Firthite tools are depicted by the use of photographs, and the furnace is operation. Specifications and a partilist are included. Copy free upon request.

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"Rubber Springs", a paper on design calculations and representative uses of rubber springs, presented at the annual meeting of the American Society of Mechanical Engineers by Mr. Walter C Keyes, Mechanical Products Engineer United States Rubber Products, Inc., and published in the May issue of Mechanical Engineering, has been reprinted in booklet form for general distribution by the rubber company.

Many charts, tables and line drawings have been incorporated in the booklet. showing the approximate physical properties of various rubber compounds; the load-deflection curves for five typical rubber compounds; load-bearing and bulge areas and area ratio for square slabs 1 in. thick and various lengths of side; shear springs and structural sponge rubber; and a comprehensive chart showing deflections in terms of thickness, per cent. Illustrations showing actual installations of various type rubber springs are also included.

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High Speed Steel

In this, the third and last article of the series, the author discusses the hardenability of high speed steels and presents the results of a series of tests made with steels of various analyses under a varying range of conditions.

By J. P. Gill Chief Metallurgist, Vanadium-Alloys Steel Company, Latrobe, Pa.

HEN any of the high speed steels are heated to the temperatures generally recommended for hardening, a solution of the carbon

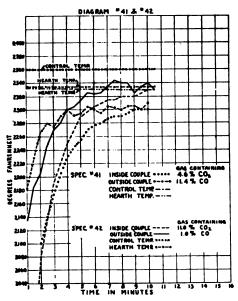


Fig. 8—Chart showing results obtained by heating two identical specimens (Nos. 41 and 42) in different atmospheres.

and alloys takes place, dependent upon the temperature and length of time the steel is held at that temperature. With the temperatures generally recommended there will appear a structure having a well-defined polyhedral grain when the temperature has been held for several minutes. The growth of this grain will depend on

the time and temperature, and upon the size of such grain will depend considerable of the physical properties of the steel such as plasticity, length changes, wear, and so on-

Presented herewith are a number of micrographs made from samples of an 18-4-1 high speed steel 1 in. in diameter after being held in a semimuffle gas-fired furnace at temperatures of 2350 deg. F. for the time specified and oil quenched but not drawn. The structure of the micrographs is usually considered of the austenitic type, but by X-ray and diffraction magnetic tests it has been proven that this structure is made up of both austenite and martensite, probably about 25 per cent austenite being included in the structures shown.

It is important, in the hardening of fine edge tools, to heat them in such a manner that the fine cutting edges will not be damaged. For many years it has been known that furnace atmospheres materially affect the surface of high

speed steel when heating for hardening. Furnaces with controlled atmospheres have been developed primarily to produce a better surface on hardened tools. It has also beer rate would fuse.

noted that in certain atmospheres the steel could be held much longer at the hardening temperature without material grain growth. Tour, and Phillips and Weldon published papers on this phenomenon. Their deductions were practically the same, namely, that the gases surrounding the steel during heating for hardening lid in fact materially affect the grain size as well as the temperature at which the carbide segre-

About four years ago the writer, ipon making an investigation of his puzzling phenomenon, at first came to the same conclusion as the investigators mentioned, but when attempting to check his results in a different furnace and with gases synthetically mixed, btained different results. Further nvestigations led to the conclusions that the gases surrounding he steel were materially affecting the temperature of the steel as well as the time of heating. number of investigators have taken exception to these conclusions and the writer again repeated his experiments to show that, by varying the composition of the gas, a change could be made in the rate of heating.

The first group of samples was treated in a controlled atmosphere furnace. The samples were taken from the same bar of 0.70 per cent carbon, 18-4-1 high speed steel. samples were machined by removing one-eighth inch of surface to give a cylindrical bar 2 inches in diameter by 2 inches long and drilling a 11/32inch diameter hole longitudinally in the center to a depth of 11/4 inch. Three thermocouples were used; one inside the specimen and another flat against the surface of the specimen: the third was the furnace control couple, located about 6 inches above the hearth. The temperature of the hearth was taken immediately before placing the specimen in the furnace and immediately after its removal. New thermocouples were used for each specimen, and temperature readings were taken every 30 seconds. All the specimens were preheated alike

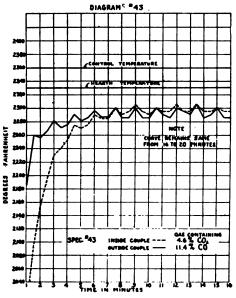


Fig. 9—Chart showing result obtained by heating an identical specimen (No. 43) in the same atmosphere as used for specimen No. 41, but holding it for 20 minutes.

in the same furnace and for the same period of time, which was 35 minutes at 1550 degrees F. (840 degrees C.).

For the first two specimens, indicated as Nos. 41 and 42, the temperature control was set at 2360 degrees F. (1280 degrees C.). An atmosphere containing the greater percentage of per cent CO was used for specimen 41 and an atmosphere of 11.0 per cent CO and 1.0 per cent CO was used for specimen 42. The results are presented in Fig. 8 and definitely show that the specimen heated in the gas containing the greater percentage of

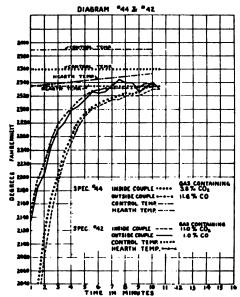


Fig. 16—Chart showing a comparison of temperature readings for specimens No. 42 and No. 44.

COs rose in temperature more rapidly and attained a higher temperature. It is interesting to note that specimen 41 never reached the hearth temperature, while specimen 42 did.

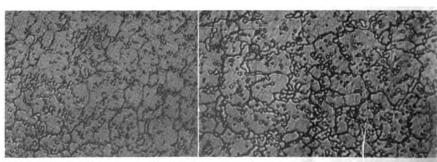
From this diagram it appeared that possibly specimen 41 had not been held a sufficient length of time to reach the hearth temperature, so

specimen 43 was heated in the same atmosphere as specimen 41 and held for 20 minutes with the results shown in Fig. 9; again the specimen did not become as hot as the hearth. By experiment a temperature was selected so that specimen 44 could be heated at the same rate and to the same temperature in a gas containing 3.8 per cent CO, and 11.6 per cent CO as specimen 42, which was heated in gas containing 11.0 per cant CO₂ and 1.0 per cent CO. It was found that the temperature control should be set at 2390 degrees Fahr. (1305 degrees C.) to obtain this heating rate.

Figure 10 shows a comparison of the temperature reading for specimen 42 as compared with specimen 44. Photomicrographs Figs. 11 and 12 taken half way between center and outside of these specimens, show no noticeable difference in grain size and the hardness of the two specimens

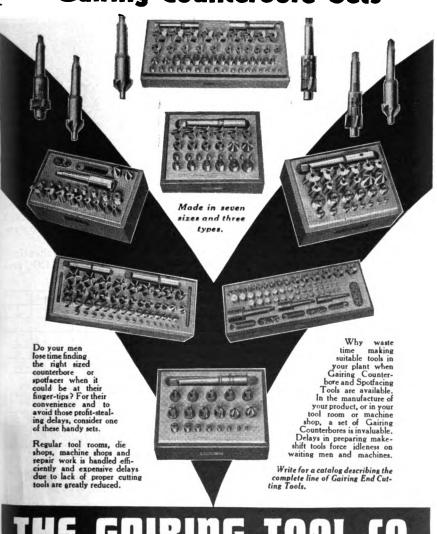
was exactly the same, namely, Rockwell 66 C. Similar experiments were made using the same furnace with about the same atmosphere but varying the temperature, and in every instance the results were similar to those given.

It must not be inferred from these experiments that the amount of Co

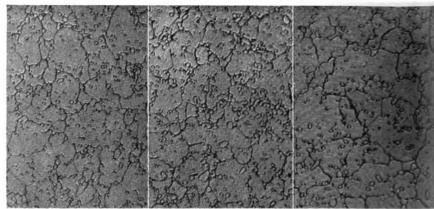


Figs. 11 and 12—Photomicrographs of the structure half way between the center and the outside of specimens Nos. 42 and 44.

Gairing Counterbore Sets



THE GAIRING TOOL CO. 1629-35 WEST LAFAVETTE - DETROIT, MICHIGAN



Figs. 13, 14, and 15-Photomicrographs of specimens Nos. 51, 52, and 53.

and Co₂ gases present alone determines the rate of heating. It is possible to keep the amount of CO and CO₂ gases constant and yet vary the rate of heating by a change in the composition of the remainder of the gas.

If atmospheres do affect grain size it should be noticeable with radically different atmospheres. To test this point, additional experiments were made with an entirely different experimental arrangement. A special quartz tube was used for the heating chamber and specimens were made from the same high speed steel bars, 1 inch diameter, machined to % inch diameter by 14 inch long with a 14 inch diameter hole drilled longitudinally in the center to a depth of % inch.

Three platinum, platinum-rhodium thermocouples were used, one inside the specimen, one against the outside of the specimen and the third for the chamber temperature (which was taken immediately before the specimen was inserted and immediately after the specimen was removed, at the same location as the specimen). the thermocouples being calibrates and renewed when necessary for each specimen. Temperatures were recorded every 30 seconds.

Specimens, without preheating were heated in pure CO, pure CO, and

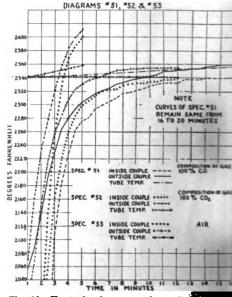


Fig. 16—Chart showing comparison of the crature curves for specimens Nos. 51, 52,

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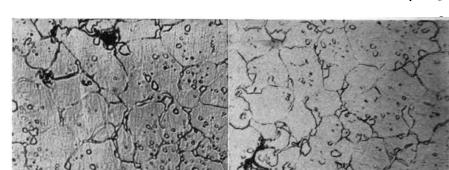


Fig. 17—Photomicrograph of structure of specimen No. 54. Fig. 18—Photomicrograph of structure of specimen No. 55.

air, and during the heating the gases were flowing slowly through the tube. each at the same rate. The tube was sufficiently long to preheat the gases, and tests were made to be certain that the gases were at the correct temperature at the position of the specimen. The tube temperature was originally set for 2340 degrees F. (1280 degrees C.) and the specimens were heated for various lengths of time in the respective gases. By comparing the grain size of the different specimens (listed as Nos. 51, 52 and 53) it was found that specimen 51 (Fig. 13) held for 20 minutes in CO gas, was similar in grain size to specimen 52 (Fig. 14) which was held 12 minutes in CO: gas, and to specimen 53 (Fig. 15), held 5 minutes in air but when the time-temperature curves of the specimens shown are compared as shown in Fig. 16, the reason is evident. The interior of specimen 51, which was heated in CO gas, did not reach the tube temperature in 20 minutes. The interior of specimen 52, heated in CO: gas, reached the tube temperature in 12 minutes and the surface of the specimen exceeded the tube temperature, while the specimen heated in air far exceeded the tube temperature both on the inside and outside. This specimen plainly shows self-heating or heating from oxidation.

The temperature and time were adjusted so that the carbide segregate would just begin to fuse when using pure CO gas; this was found to be 2425 degrees F. (1325 degrees C.) for 7½ minutes for specimen 54, the microstructure of which is shown in Fig. 17. The time-temperature curve of specimen 54 was then reproduced specimen 55 but pure CO2 was used. It was found that a tube temperature of 2400 degrees F. (1310 degrees C.) produced about the same curve, using CO2 gas. Fig. 18 is a photomicrograph of specimen 55, showing a structure quite comparable to specimen 54, heated in CO gas. The timetemperature curves of specimens 54 and 55 are shown in Fig. 19.

Volume changes, sometimes called length changes, will depend to a considerable extent upon the size of the austenitic grain and again it was found that, by varying the atmosphere, considerable control could be had over length changes, but such control is really dependent upon the austenitic grain size, the atmosphere control simply being a part of the

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mechanics of varying the time and temperature. It can be stated that until something of the knowledge of the effect of atmosphere became known, it was impossible to compare the results obtained by one temperature and time in one furnace with those in another.

Plasticity and hot hardness will depend to a great extent upon the size varying the time and temperature of treating, thus also resulting with a different alloy solution.

It was found that were the grain size obtained by treatments previous to the final hardening, the same relationship of the effect of grain size on plasticity was obtained but not with

the results on hot hardness. Largegrained specimens showed no higher

hot hardness than did small-grained specimens when the varying in grain size was obtained by preliminary treatments and the final treatments were the same, which is consistent with what the text books say on the effect of grain size

on hardness.

C. Si. Mn. Composition of Steel - 0.71 0.26 0.24 18.02 3.98 1:07 Size of Specimen - 1 c. m. dia. x 1 c. m. long - Ground Finish Tested at - 1200 degrees Fahr.

Specimen Number	Grain Size	Average Brinell Hardness by Mutual Indentation	Grain Size obtained by
n	Small	342	Final Treatment
12	Medium	390	Final Treatment
13	Large	409	Finel Treatment
40	Large	345	Preliminery Treatmen

Final treatment of specimen 40 same as specimen 11

of the austenitic grain. The plasticity is greater with a small grain and the hot hardness higher with a large grain. The diagram Fig. 20, showing the plasticity of an 18-4-1 high speed steel also shows that specimen 11T had a small grain, 12T an intermediate size grain and specimen 13T a large grain. In table 3 are given the hardness results at 1200 degrees Fahr. for an 18-4-1 high speed steel with different size grains. The grain size in the specimens was obtained by

With the tungsten, molybdenum. chromium and vanadium constant in the non-cobalt steels, the hardness attainable is dependent upon the carbon content and with .70 per cent carbon, any one of the steels can be hardened to a hardness of Rockwell 64 or In any one of the types, the carbon is easily the most important of the elements that influence the maximum attainable hardness. Consequently, in making a comparison of



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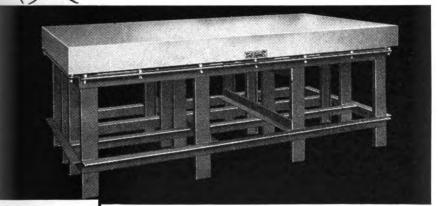
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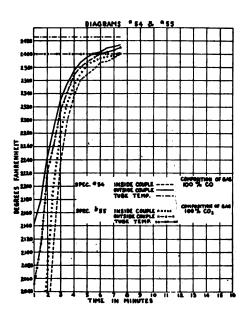


Fig. 19—Chart showing comparison of time-temperature curves for specimens Nos. 54 and 55.

either cutting or physical properties between different steels, it is most important that the comparison be based on steels of a comparable carbon content.

An examination of the structure of annealed high speed steel shown in Fig. 21 shows a large number globules of the tungsten segregate. chiefly spheroidal in appearance. Ιf hold the steel at an elevated temperature. that is, something over about 1700 degrees F. for a prolonged length of time, these spheroids

have a tendency to become more crystalline in appearance so that they will appear angular rather than spheroidal, as shown in 22 and 23. When this happens, the maximum attainable hardness is noticeably less and steel of the same composition having the segregate in a spheroidal appearance that can be hardened to 65 Rockwell C may only be hardened to about 62 Rockwell C on a further crystallization of the segregate and using same treating procedure. Furthermore, unannealed speed steel can often be hardened from 1 to 11/2 points higher Rockwell C than can the same steel in the fully annealed condition, which is much the same as with other types of tool steels.

A second re-hardening of high speed steels from the usual hardening temperature will result in a so-called "fish scale" or flaky structure (Fig. 24) which is more easy of development with decrease

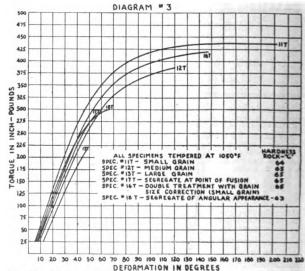
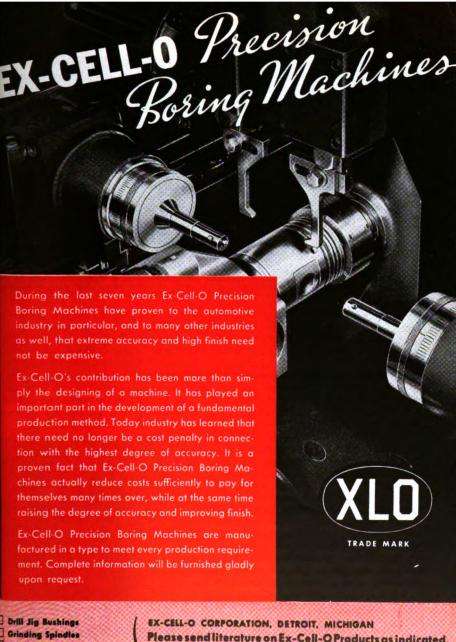


Fig. 20—Diagram illustrating plasticity of high speed steel and its relation to hot hardness and grain size.



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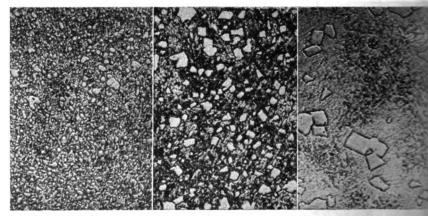


Fig. 21 (Left)—Photomicrograph showing structure of annealed high speed steel in which large number of globules of tungsten segregate, chiefly spheroidal in appearance, can be a Figs. 22 and 23 (Right)—Photomicrograph of the same annealed high speed steel as shown Fig. 21, but held at a temperature of over 1700 deg. F. for a prolonged length of time.

in the tungsten content in the steel. The same structure may be brought about on the initial hardening of a steel which has been highly coldworked without sufficient annealings between passes. Such a structure in a tool may result in excellent cutting properties but causes brittleness and usually chipping. It should be avoided and can be prevented.

Any of the steels may be satisfactorily air hardened in small sections. that is, in sections under about 1 inch in diameter. In larger sections they may be satisfactorily air hardened, depending upon the hardness desired, but even in sections as large as 3 inches and 4 inches in diameter there usually will not be over two points Rockwell difference between air and oil hardening. Large sections, however, when air cooled, do not show the same degree of secondary hardness as do oil-quenched specimens and usually there will be a greater difference in the hardness between air and oilquenched specimens after tempering to 1050 degrees Fahrenheit.

It is necessary to cool all of these steels to a temperature under about 350 or 400 deg. F. before temperiotherwise there is a possibility the decomposition of the austenite mot take place and the structure the steel after drawing would be all respects similar to an undrapiece of steel. Any type of high spesteel in the freshly quenched conditions is quite plastic and can be deform



Fig. 24—Photomicrograph showing flaky striure resulting from a second rehardening high speed steel from the usual harden temperature.

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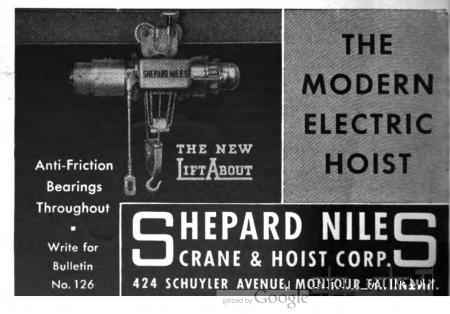
to a reasonable extent without breakage. It is, therefore, best in the straightening of tools to straighten them immediately after quenching and before drawing.

It has been found that, by increasing the carbon content of high speed steel by pack hardening with a carburizing compound, the wear resistance of the steel is greatly increased and this treatment is used for certain types of blanking dies or wearing parts. A piece of an 18-4-1 steel with an initial carbon content of .70 per cent packed in charcoal and held for 25 minutes at 2000 degrees F. showed a surface carbon content of .78 per cent: at 50 minutes a surface carbon content of .90 per cent and at 90 minutes a surface carbon content of 1.02 per cent.

Attempts have been made to nitride high speed steel with the regular nitriding procedure with rather unsatisfactory results, as usually the

edge is embrittled to such a degree that chipping occurs too readily. Some tool makers have immersed the steel in a molten bath of sodium and potassium cyanide at a temperature of about 1050 degrees F. for from 10 minutes to 2 hours. Such a procedure is applied after the steel has been hardened and tempered in the regular manner and some users have claimed exceptional results with the treatment At least it has proven sufficiently satisfactory to some makers of high speed steel tools so that they use it as a regular procedure. Others who have tried it claim an embrittlement of the cutting edges.

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Lubrication and Gears

A summary of the results that have been achieved through a series of tests made in the Research Laboratories at Stanford University.

By J. Roy Petersen

THE problem of wear on gears has never ceased to be one of interest to machine manufacturers and especially the gear manufacturer who faces new angles of the question every time a new type of gear is designed to meet some special conditions.

This was particularly true with the introduction of the hypoid gear in the automotive industry. Efforts to lower the drive shaft to comply with the trend toward low, streamline automo-

biles have thrown more and more los on the axle due to a smaller axle ar to the necessity for the axle to carr the added power which is today bein required of the engine.

This added load has caused an u gent need for different types of lubr cants because of the excessive slidin speed of the gears and the high un loads. This increased load capacit has gone beyond the straight miner with its lower film strength, and ne

and special lubricant are needed to prever extreme wear.

Realizing the nee for an adequate metho of determining not onl the wear on gears bu also the ability of cer tain lubricants to hol up under exacting con ditions. Howard Mark and Carl Ross of th Stanford University Research Laboratorie in the Division of Me Engineering have been experiment ing for the past few months with this prob lem and have built a machine which simulates the actual opera-The gears. machine, shown in Fig. 1, is so constructed that it can be graduated for different loads

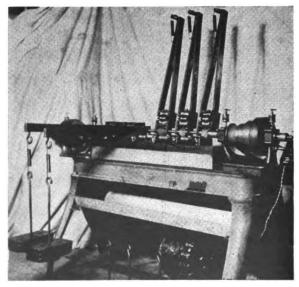


Fig. 1—Machine with two lever arms lowered into position and three lever arms raised to show the construction of the driving box. Heights up to any amount could be added to duplicate the loaded conditions experienced in actual service.



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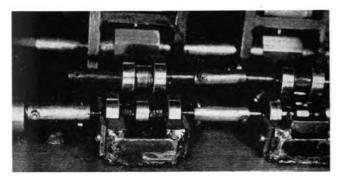


Fig. 2—This illustration shows how the several sets of relies were attached in alcoves in one less drive shaft. The relie that was measured for wear in the ene in the middle at the bedfus the outer two belies that the left was run it had bearings. The relies at the left was run in hy poid lubricant with heavy base. The idealor is bedfur at the relies is bedfur at the relies in bedfur at the seven at the relies in bedfur at the relies in the r

and is made also to test several kinds of lubricant under the same conditions at the same time.

While tests can be made under actual road conditions and in factories allowing geared machines to run for definite periods of time under standard conditions, the value of the testing apparatus of these two Stanford men consists in that it provides an easier and more economical check on lubricants and wear as compared to the more difficult and expensive processes that have been used in the past.

As machine manufacturers and designers are aware, the gear principle reduced to its simplest elements is but a rolling and sliding action, the amount depending upon the type of gear and the load capacities. Taking over this idea, the machine has been designed to employ the use of rollers with which they can duplicate rolling conditions, a combination of rolling and sliding, or pure sliding. The machine was adapted from a similar one used by Westinghouse for tests of pitting on pure rolling contact only. their machine, Ross and Marks can obtain the rolling and sliding by separately controlling the upper and lower rollers. There were two essential differences between the Westinghouse tester and the Stanford apparatus. The former used individual gear drive but in the latter, the rollers are coupled together with sleeves as shown in Fig. 2. Also, Ross and Marks controlled the upper roller in their experiments while the Westinghouse did not.

While the Stanford machine can make all the tests accomplished on the Westinghouse tester, it goes farther as will be brought out later, but the correlation of tests made by the two machines is quite significant. Marks and Ross said that they verified many conclusions arrived at by the Westinghouse engineers. They determined that pitting could not be obtained with clean lubricants in pure rolling at a load less than 0.7 of the ultimate

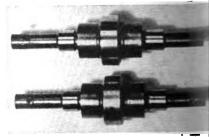


Fig. 3—Photograph of the rollers used in experiment. Measurements for wear to 0.000 inch were made.

strength of the steel in the rollers. Results also verified the fact the dirty lubricants pitted the rollers were loads ranging down to 0.3 of the maximum strength.



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As a base for the Stanford gear testing machine, the bed of an old wood lathe was utilized. Lower bearing blocks were mounted seven inches from center to center on a five-inch steel channel which was bolted through a timber that served as a spacer for the lathe bed. Driving was accomplished by lathe headstocks on each end. Bottom mounting blocks, which held the oil pan, were made of cold

tion as if idling, both the rolling and sliding action which is met in most gears was obtained, but more markedly in hypoid gears. The rollers, upper and lower, were revolved at different speeds. The application of this to the modern auto gear is that the machine can test unit loadings for slippage up to 1200 feet a minute.

Perhaps a word concerning the de-

Perhaps a word concerning the design of the rollers, Fig. 3, is necessary

to get an adequate picture of the experiment. They were made S.A.E. No. 3145 with a Rockwell hardness of C-35. Roughly turned out of bar stock. the rollers were heat treated and finally ground to a standard diameter — the lower ones to 1.576 inches and the upper, 1.5 inches. To insure contact across the com-

plete face of the lower rollers, which were measured to 1/100,000 of an inch, the upper rollers were made % inch wide, while the lower ones were only a half inch in width. Measurement of the rollers to detect wear was done on a Pratt and Whitney measuring machine after the rollers had been allowed to cool for 12 to 14 hours.

There was no appreciable wear on the rollers in the first runs, which were tests of pure rolling. Under the combination of rolling and sliding, accomplished by the two shafts being driven at different speeds, the wear was quite rapid at first but decreased intil it was practically negligible after 15 to 20 hours of operation. This tapering off was attributed to the influx of work hardening. The possi-

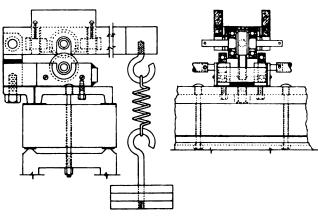
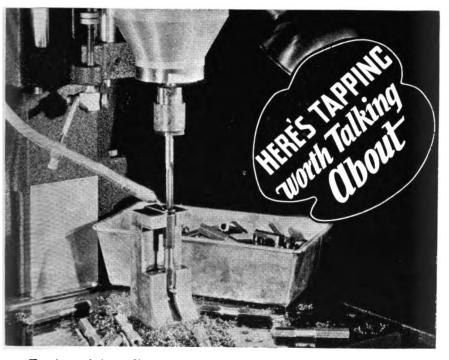


Fig. 4-Cross section drawing of testing machine.

rolled steel shapes, arc welded. The rollers were mounted in ball bearings. Lever arms 32 inches long, made of structural steel with a forged hook to hold graduated weights which applied the various unit loads, were designed to drop over the rollers. Power was furnished by a 3 h.p. motor of a squirrel cage induction type. This drove a line shaft which in turn drove the head stocks by means of belts.

The first tests were rolling tests and were made with the top rollers idling; that is, having no drive, but with the lower rollers being driven 1450 r.p.m. The results already mentioned above checked with similar tests of rolling made by Westinghouse.

By applying power to the top rollers which turned in the same direc-



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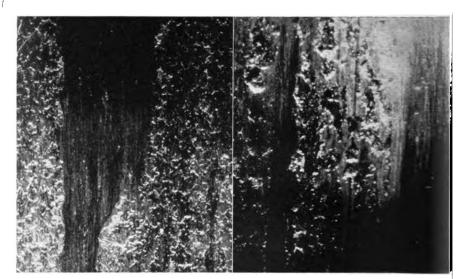


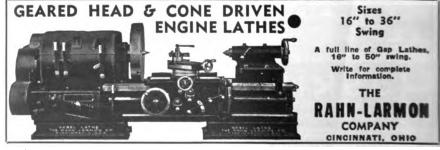
Fig. 5—Surface of roller showing condition after 2¾ hours of slipping action simulating that of a hypoid gear in ordinary worm gear lubricant. Magnification, X 14. Fig. 6—This illustration shows the results when hypoid lubricant fails, as it did, under slippage of 368 feet per minute. Maximum normal unit load, 80,000 pounds. Magnification, X 14.

bilities of flaws in the metal were not investigated, due to the restrictions in scope of the research.

In formulating conclusions for the results obtained so far, the Stanford researchers say that hyphoid lubricants have shown to fail in a lubricating capacity under extreme loads, but they have the ability to smooth the scuffed surface by continued operation at lower loads without appreciable wear.

by the load and the slippage. It was found that ordinary motor oil, used mainly for comparison, broke down easily under loaded conditions. The E.P. (extreme pressure) lubricants also broke down but not so easily—the one with the heavier viscosity surprisingly having less film properties to hold up. Worm gear lubricant broke down rapidly under unit loadings at which the mild E.P. lubricants stood up very well.

Effective lubrication is influenced The hypoid lubricant, of course, held



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up best, yet it lost some of its lubricating properties, and acted only as a weld preventative under heavy loads.

In the opinion of the Stanford men, the results of experimentation so far indicate that the lubrication problem has become a vital one with reference to the wear on gears. These results will, of course, have no effect on the design of hypoid gears or any other gears at



Fig. 7—Pitting after 72 hours pure relling with a heavy load at 1450 r.p.m. in ordinary motor oil. Before running, this steel had a Rockwell hardness of C-35. Magnification, X 14.

the present time. It will, however, encourage more experimentation with lubrication to furnish the production engineer and machine manufacturer with oils that will meet the many needs of present-day conditions of load, speed, and gear operation.

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Additional Notes on Boring Long Holes in Frame of Recoil Mechanism of 75 mm. French Guns

BY A. L. DELEEUW

In my article on the boring of long holes in the frame of the recommechanism of the 75 mm. French guns (Page 66 August, 1937, issue Modern Machine Shop), mention was made of two cradles. In some way these cradles were mixed up. This is not as serious as the mixup of babies, which everyone must have read about in the daily papers; nevertheless it is confusing.

One of these two cradles was meant for the lay-out machine and the other for the actual drilling of the holes. The sketch of one of these cradles shown in the first part of the article shows the essential elements of the drilling cradle, and the description of it at that point would make the reader think that it was used in the lay-out machine. Now, these two kinds of cradles were not at all interchangeable.

In the lay-out machine, the work piece was so adjusted that all of the sliding rods would touch the piece—if this were possible at all. If it was not possible, then the forging was rejected, for it would not be possible to clean it up at all points. Once the piece was adjusted, something had to be done to make sure that, in the various succeeding operations, there should be no stock to be removed. For this purpose, the two holes at each end were drilled. These holes served as gage points for the first operation, which consisted in the planing of two

strips. These strips then served as gage points for all further operations.

The reason why two holes, and not just one, were drilled at each end was that a single hole at each end would still leave the position for subsequent operations undetermined. The piece could be revolved around the axis if there were only one hole at one end. If there had been two holes, but at one end only, it would be possible to lay the forging down with one end too much to the right or left, or too far up or down. It would have been sufficient to have two holes in one and only one in the other, but this, too, would have led to some trouble, for it was sometimes necessary to turn the piece end for end in order to reach certain points with the tool. Besides, it took no more time to drill two holes at each end than it would take to drill one hole at one end and two at the other.

These preparatory holes were drilled in the positions occupied by the final long holes. The fact that the forging had to be adjusted to some as yet unknown position when it was first laid in the lay-out machine precludes the idea that the cradle in which it was laid was centered in the faceplate of a lathe. The article speaks of a lathe bed used for the main frame of this lay-out machine, but this was only done because such a bed was available and eliminated the necessity of making a pattern and casting. The machine itself bore no further re-



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semblance to a lathe. There was n faceplate, and, consequently, nothin could be centered with it.

However, the machine in which the drilling was done was a lathe. Ther was a headstock with a faceplate, and it was essential that the forging which, by that time, had undergone number of operations, should be certral with the spindle of the machine. The jig, or cradle, holding the forging for the drilling operations, was turned at both ends as the diagram showed. This permitted the jig to be place exactly central with the faceplate and, therefore, with the spindle.

It is hoped that the foregoing will clear up whatever confusion may have been caused in the mind of the reade by the misplacement of the diagram and its description in the previous issue of the magazine.

"Tools of Industry by Williams" is the title of a 184-page catalog now being issued by J. H. Williams & Co., 7 Spring St., New York, N. Y., which describes the entire industrial line of drop-forged wrenches and other standard stock specialties made by this firm Included are many additions to the Carbon and Alloy Wrenches, detachable "Supersocket" Wrenches and "Agrippa Tool Holders.

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Precision grinding diameters, 15/16", 5/8" and 3/4" on feed shaft.

MACHINE:

Cincinnati 6 x 30 Plain Hydraulic Grinding Machine.

MATERIAL:

Chrome nickel steel

Minus .001" on 15/16" diam. Minus .0015" on 5/8"diam. Minus .002" on 3/4" diam.

PRODUCTION:

10 pieces per hour-three operations on each piece.

METHOD EMPLOYED:

Plunge-cut and traverse grind-

COOLANT

One part SUNOCO to 20 parts water.

Courtesy of Cincinnati Grinders Inc., Cincinnati, Ohio.

in operation and designed to maintain closer tolerances — plus tion per work hour-depend on operator interest in greater producthe grinding coolant for efficient production.

SUNOCO is the grinding coolant to assure efficient production consistently. In the grinding operation it has made possible closer

NEW grinding machines, flexible limits of accuracy, faster stock removal without increasing wheel minimum the danger of burning wear, and yet has reduced to a the work.

per abrasive unit specify the modern grinding fluid developed to For mirror finishes, greater precision, and increased production meet every grinding requirement—

SUNOCO Emulsifying Cutting Oil.



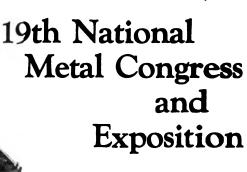
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Atlantic City Auditorium *

LIVE great technical societies are cooperating in presenting, for the benefit of American Industry, the Nineteenth National Metal Congress and Exposition, which is to be held in the Atlantic City Auditorium, Atlantic City, New Jersey, October 18 to 22 (inclusive), 1937.

The membership rosters of these five societies include the scientists. engineers and technicians who are most largely responsible for the factors of safety, performance, high production, and corresponding low costs which as a result of their research in metals are the outstanding characteristics of American metal manufacturing. For the past twelve months these men have been working quietly in their laboratories developing new metals or new methods of processing the metals now in use. The National Metal Congress is the one time in the year when they leave their laboratories and get together to compare notes and report on the developments that have taken place and the results that have been obtained since their last meeting. This convention will afford an opportunity for all who are interested in the scientific

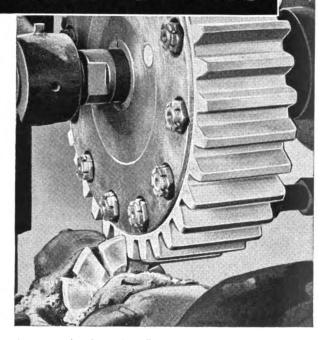
side of metal manufacturing to bring their knowledge up to date.

American Society for Metals program will include a two-day symposium on carburizing, with fourteen Thirty sessions. technical papers on a variety of metal subjects will also be presented. Two lecture courses will occupy the hours of late afternoon and evening, one comprising a comprehensive five-lecture series on steel making, the other consisting of three lectures on metallographic These lecture courses will technic. be presented by men who are acknowledged peers on these subjects.

American Institute of Mining and Metallurgical Engineers program will include a round table discussion on "Physics of Metals", a technical session, and the annual "Science Lecture" of the A.I.M.E. which this year deals with "The Behavior of Gases at Metal Surfaces." A joint sponsorship of the round table discussion by the A.I.M.E., A.S.M., A.S.T.M., and American Institute of Physics promises a wide range of viewpoint and opinion. Other technical sessions will be devoted to general metallurgy, metallography, and open hearth practice.

American Welding Society has arranged a well-balanced technical program with sessions on both industrial and fundamental research in welding. Other aspects of welding which will

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THERE is no denying the fact that INSUROK silent plastic gears (non-metallic) deliver greater gear value per dollar invested. This is because INSUROK possesses in a higher degree those qualities of durability, toughness and wearability that insure longer life and freedom from costly, frequent replacements. Learn how the superior performance of INSUROK gears can be turned to the gear cutter's profitable advantage.

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Detroit Office: 4-252 G. M. Building, Phone Madison 938 New York Office: 75 West Street, Phone Whitehall 4-448 form the subject of separate sessions are Fabrication by Welding, Shipbuilding, Welding on Railroads, and Welding of Alloy Steels. The Fundamental Research Committee will again meet to discuss work done and plan future projects.

American Society of Mechanical Engineers will have a one-day program presented jointly with the American Welding Society in which the mechanics of welding and the relation of design to welding will be featured. This will be a very interesting and valuable discourse on a very important subject.

The Wire Association will have the usual informal discussions and the Association's headquarters Ambassador Hotel will be open from 9 a.m. to 11 p.m. daily for this purpose. A varied group of papers will also be presented at the daily technical sessions. The subjects featured in the Ferrous Division will include. Fatigue of Springs, Pickling, Cold Heading, Grain Growth, and Galvanizing. The Non-Ferrous Section will listen to papers and discussions on the Production of Copper, Fourdrinier Wire, and Copper in Apparatus Manufacture.

The National Metal Show will include displays of more than 225 leading industrial organizations among which will be actual operating exhibits presenting the newest developments in plant and research equipment. Every aisle in the huge auditorium will be lined with exhibits representing the most modern ideas in metal research, and in attendance at each exhibit will be metal and equipment experts to answer questions about their products. gether, this Metal Congress and National Metal Show will provide the one opportunity of the year for the engineer or manufacturing executive to obtain, firsthand, answers to the problems which have confronted him during the past twelve months. five technical societies listed above have combined in inviting the visitor to the Show to bring his problems with him and will be only too glad to see that he meets the men who will understand his problems and can give him the right answers.

Registration is the only requirement for admission to the National Metal Congress for any engineer, technician or executive engaged in any phase of the metal industries.

Louis Allis Motors. The Louis Allis Co., Milwaukee, Wis., has issued a very complete sixty-page book describing the construction features, advantages and applications of practically every commercial type electric motor.

This complete sixty-page book also includes valuable engineering data on various types of special motor applica-

tions and construction.

It includes a detailed analysis of the characteristics of squirrel cage motors, motors for centrifugals, and so on.

A copy of this completely illustrated beautiful, colored book will be sent no charge to anyone directly interested in the purchase, operation or maintenance of electric motors if requested on company stationery.

Foote Gears, Speed Reducers and Couplings. A beautifully-printed book containing 72 pages of description and illustrations of the speed reducers, gears and couplings made by Foote Gear Works. Inc., 1301 S. Cicero Ave., Chicago, Ill., is now being distributed by that firm. The book explains the construction and design details of Foote heavy duty worm gear speed reducers, herringbone speed reducers, and Foote couplings, and also presents ordering data, selection information, list prices, weights, ratings, dimensions, lubrication data, and whatever information may be of interest or value to the user of equipment of this type. Many photographs and cross-section drawings are included, together with tables of specifications. Copy free.

Modern Equipment at Work

Copper Plating for Lubrication

[7HEN the word "lubricant" is mentioned, it is customary to think of grease or oil, consequently the idea of copper serving as a lubricant is—to say the least—unusual. But it is performing that function, and successfully, too.

Some time ago it was discovered that copper, when used to impregnate the surface of iron or steel, imparts a lubricating quality to the surface of There are many places the metal. where this discovery can be used to advantage, among which is the contact between the cam on an automobile engine camshaft and the valve lifter. In the Oldsmobile the camshaft is of alloy cast iron and the valve lifter is of hardened steel. At a speed of 60 miles per hour, each cam in an Olds engine revolves under its valve lifter 1550 times per minute, and with 12 or 16 of these cams operating as many lifters at this speed, the need for a helpful lubricating agent is obvious. The application of a film of copper to the cam simplifies the problem at the time when it is most im-

portant - during "running-in" the period.

The secret lies in the fact that, as the surface of the cam slides over the flat surface of the steel cam lifter, the lifter "wears" the copper into the pores in the surface of the cam and imparts to it an initial quality which can only be described by the word "lubricated." In other words, the combination of the copper with the hardened steel substantially reduces the coefficient of friction and precludes the possibility of scoring during the initial running-in of the motor.

The copper plating operation referred to is the last operation on the shafts; thus they are finish-ground to size before arriving at the plating tank. The equipment consists of the Meaker Return-Type Quick Transfer Automatic Plating Machine shown in the illustration. The machine consists primarily of five baths in sequence, arranged to handle the shafts in and out of the baths automatically and including the necessary accessory equipment. The machine is approximately 18 ft. 5 in. long overall and 9 ft. wide, with a height of approximately 12 ft. 4 in., which is necessary



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due to the length of the shafts. The machine will handle 100 shafts per hour, depositing from 0.0002 to 0.0003 in. of copper on each shaft.

The machine is arranged to perform the following sequence of operations:

1.	Alkaline Cleaner	1 1/2 min.
2.	Rinse	1/2 min.
3.	Copper Plate	15 min.
4.	Cold Rinse	1/4 min.
5.	Hot Rinse	1/2 min.

18 min.

Carriers are of the double-file type, carrying two camshafu on each side, or be tween each row of anodes. The COTveyor carries the shafts down one side and returns them or the other side having passed them through the various cleaning, rinsing. and plating operations and delivered them back to the starting point a finished job.

In the plating operation a single strand conveyor cannot be employed because of the time required for raising the material out of one tank and lowering it into the succeeding tank. Unless the transfer can be made quickly, oxidation begins and even a small amount of oxidation interferes with the proper plating of the surface.

To overcome this objection, a transfer mechanism has been developed which raises the hanger from the conveyor, advances it over the end of the tank, and



A coating of copper on the cams serves as a lubricant and helps the Olds engine to run smoother and easier during the "running-in" paried.



SMALL DIAMETERS

-can be threaded with the EJ4

Those small diameter screw threads you have been cutting with solid dies can be cut with the Geometric Style EJ4 Die Head. The cost of the tool is small and the cost of chasers is less than most solid dies. The chasers can be resharpened easily, giving longer life. Adjustment within the head makes the last thread as accurate as the first.

The Style EJ4 has a range of 1/16" to ¼". The diameter of the head is 1", the length without shank is 34". It is built with plain shank or with threaded back part for the B & S Threader. Shall we send you our booklet?

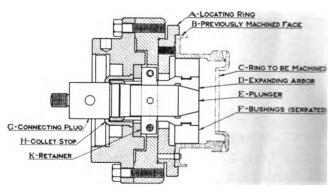
THE GEOMETRIC TOOL CO.

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lowers it into the succeeding tank in a period as short as from 10 to 15 seconds. If the carrier were permanently attached to the conveyor, from 1½ to 2 minutes would undoubtedly be required for the work to travel the same distance, which would allow time for oxidation and thus make the operation impractical.

The use of automatic equipment for this operation makes it possible to establish a definite amount of time for each processing operation. With the conveyor set for a definite speed, it is evident that a certain definite amount of metal has been deposited, and that the cleaning and rinsing have been properly done. line of each shaft. This part must be very carefully machined. Finish cuts must be accurate to within 0.001 inch.

The problem was to chuck quickly on a turret lathe the ring-sleeve forging, which had one face and diameter already machined. All cuts thereafter had to be made in relation to this already machined surface. A



Drawing showing cross-section of fixture by The Warner & Swassy Company to machine a self-aligning coupling.

Machining 13 Surfaces at One Setting of the Work

THE rapid machining on a production basis of very accurate parts frequently offers unusual problems How these were solved at the Bartlett-Hayward Company, Baltimore, Division of Koppers Company, is shown in the accompanying illustration.

The job is a self-aligning coupling for direct connected power units. In service, the coupling provides for misalignment of two rotating shafts where extreme care must be taken to avoid bending stresses and the resulting pressures on bearings. An essential part of the coupling is the combined ring and sleeve, which both engages the unit and controls the center

special air-operated fixture assembly was designed by The Warner & Swasey Company, Cleveland, turret lathe manufacturers, for accomplishing the desired result and holding to the allowable limits of accuracy and at the same time allowing for internal clamping so that the maximum number of operations could be performed at the setting of the work.

The diagram shows a cross section of the fixture, the important element of which is the locating ring A. Note also the floating expanding arbor D with its bushings F, plunger E, retainer K, and connecting plug G.

With this special fixture attached to the lathe spindle, the operator simply slips the ring-sleeve, which has a face previously machined B, into the locating rings and turns on the air pressure. The pressure on the plunger

(Continued on page 144)

GENUITS GENUINE OILGEAR URFACE BROACHING MACHINES

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Ideas from Readers

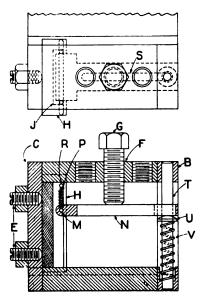
This department is a clearing house for ideas . . . If there is a "kink" or short cut in use in your shop, send in a description of it . . . Each one published will be paid for

Universal Cutting-off Fixture

By John A. Honeger

T frequently becomes necessary to cut material—either round, square, hexagon, or rectangular—to length on a production basis, using either a power hack saw, milling machine, or band saw. Vises of the ordinary type can, in some instances, be used to hold the work for such operations, but because the vise confines the workpieces in one direction only, a considerable amount of time may be consumed in aligning the pieces or evening the ends in the other direction.

To facilitate the accurate aligning of a large number of bars or rods for



cutting off purposes, the fixture showin the accompanying illustration we designed. The fixture can be adjust to take any number of rods within a capacity, and is identical at each e of the spacer plate A, which can made to any length required.

To the sides of the plate A are a tached the uprights B and C. The re tangular slot D is milled in uprig B, and two holes are tapped for tadjusting screws E in upright C. Tupper crossrail F is fastened to tupright members as indicated. The holes are drilled and tapped in the crossrail F, the central hole being f the clamp-screw G.

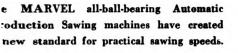
Between crossrail F and space plate A slides the adjustable uprig H. A T-slot J is milled in upright I as well as the recesses K which for the lugs L. In the T-slot slides the p M on the leaf N. To this pin are a tached the springs P, which in turn are attached to the pin R. Leaf N h an elongated slot milled in it to alk for horizontal movement of the leaf in the front end of the leaf is the p T, upon which ride the washer U as

the spring V.

The construction of the fit ture is such the it may be adjusted in both hore

Design of Fixture for Helical Control of the fit ture is such the it may be adjusted in both hore.

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MARVEL

High-Speed-Edge Hack Saw Blades



Armstrong-Blum Mfg. Co.

"The Hack Saw People"

5745 Bloomingdale Ave., Chicago, U.S.A.

134

zontal and vertical directions so that any number of pieces can be inserted and securely clamped. If this fixture is held in the ordinary type of vise either in a power hacksaw or on a milling machine table, it will give complete satisfaction.

Squaring Locomotive Frames By F. N. Burch

UMEROUS methods have been employed to make locomotives track square; in other words, to keep from cutting the driving wheel

in size, as shown at A, Fig. 2. The flat side of the rectangular piece is ground smooth opposite the weld then, using a thin saw, a slot 1/2 in deep is cut in the vertical section of the "T" at a point near the end, as shown. It is important that the slots in the two pieces be exactly the same distance from the smooth sides of the rectangular pieces.

In use, the spacers are clamped to the frame near the approximate centers of the driving wheels; at the front driving box shoe and the rear driving box wedge as shown at A.

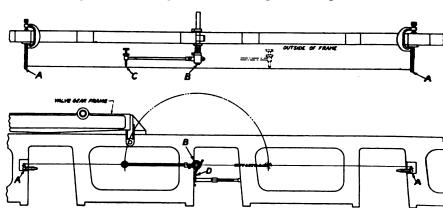


Fig. 1-Drawing illustrating use of a taut line and pointer for squaring locomotive frames.

flanges. We have used the fish-tail tram and have run lines through cylinders, but still experienced a lot of trouble with flange-cutting. The trouble has been overcome, however, by squaring the locomotive wheels with the frames instead of squaring them with the cylinders. The method used is very simple.

The instrument used for this task consists of a pair of spacers and a tram, with the necessary accessories. The spacers are made from two 8-in. lengths of 1-inch T-iron, each of which is welded to the center of a rectangular piece of soft steel 1x4x6 in.

Fig. 1. Then a thread, with some small object such as a nut tied onto the end to hold it, is slipped into the slots in the spacers and drawn taut. If the slots are properly cut in the spacers, the thread will be the same distance from the frame at both ends.

The tram consists of two pieces; the shaft and the pointer. The shaft is made from 2½-inch steel tubing and is cut 12 inches longer than the spread of the frame. This extra length is to allow the shaft to project beyond the sides of the frame so that the pointer can be assembled to it as shown at B, Fig. 1.





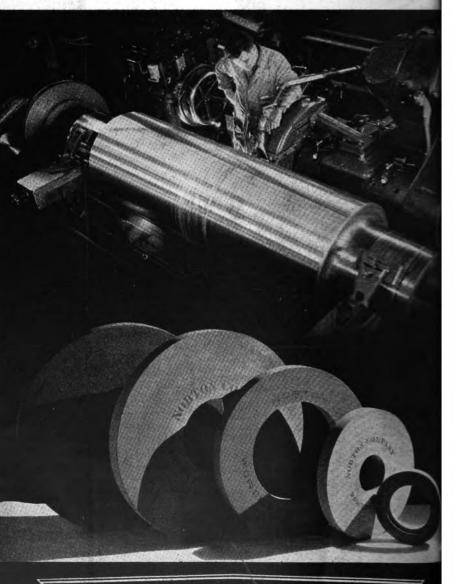
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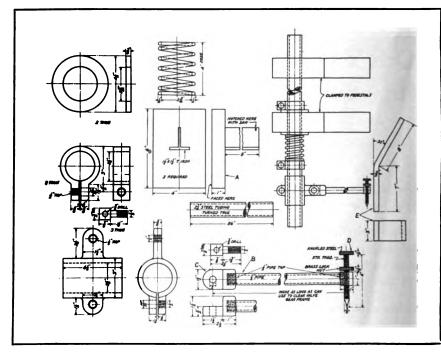


Fig. 2-Detail drawing of parts required for instrument for squaring locomotivo frames.

The pointer is made from ½-inch pipe as indicated at B, Fig. 2, which is as long as it can be made and still clear the valve gear frame. One end of the pipe is screwed into a clevis, C. which is bolted to a fitting on the end of the shaft as shown at B, Fig. 1, and the other end of the pipe is screwed into a block through which a hole has been drilled for the thumbscrew D, Fig. 2.

When ready to square up a frame, the shaft is placed in position in the angles of two angular pieces designed as shown at E, Fig. 2, and held in place on the right and left frames by spreaders as shown at D, Fig. 1. These pieces are made from $\frac{4}{3}$ x3x18-in. soft steel, bent to a 30-deg. angle as shown. With the spacers in position and the thread taut, the pointer is ad-

justed until it just touches the line at either front or back and is then swung to the other direction. If the shaft is not square with the line, a shim is placed behind the shaft and adjusted until the pointer will touch the line on both sides. When the line is at right angles to the shaft, the square of the line is transferred to the frame with a square.

When the pointer is moved from front to back, the shaft is kept from moving by means of a set collar which is placed next to the inside of the frame with a set collar and spring on the outside. As the pointer is clamped to the shaft, the shaft revolves when the pointer is swung back and forth

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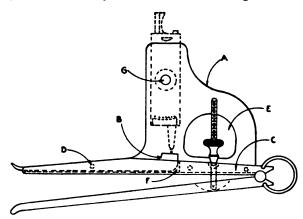
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ISSION DI-MOL

causes as loose center castings, laterals not properly divided, listing of engine on account of worn spring rigging, and so on.

Caliper with Indicating Leg By Jos. R. Cowles

THE drawing presents the design of an indicator which has one leg pivoted in such position that it con-



Drawing of caliper equipped with indicater and pivoted leg.

trols the plunger of an indicator, thus making it possible to determine a variation in dimensions by thousandths of an inch. Such a tool makes it unnecessary to continually reset and regauge holes in transferring measurements or in making fits.

The caliper illustrated is of capacity, and the indicator "Koch." However, an "Ideal," Word," or any other light individual serve the purpose.

One leg of the caliper is cut the point indicated at F. A sec 1/16-in. cold rolled steel plate i cut to the shape indicated enough stock being left at the right hand edge so that it ca

folded around the leg C and riveted the leg as shown. As opening E is made for the adjusting nut.

A substitute leg B is made and pivoted at the the point D to sheet steel frame, the leg being of the same shape as the original leg with the exception of the part at the point of the arrow B, which is made to serve as a base for the plunger of the indicator. The indicator is held to the frame by its stud, which is inserted through the

hole G and the thumb nut screwed on at the other side of the frame. This hole will have to be positioned according to the type of indicator used, and must be located so that the plunger will record any pressure on the point of the leg, as, for instance, when the

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caliper is being used to discover the amount of out-of-round of a hole.

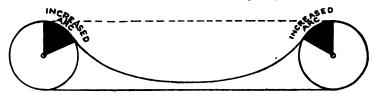
Are Slack Belts Impracticable?

By W. F. SCHAPHORST

HAVE been severely criticized a number of times for advocating slack belts. My critics tell me that

prove, however, that the contentions of these contenders are not true. One of the most recent and most convincing proofs comes from Ohio State University, and is the result of experiments conducted by Professors C. A. Norman and G. M. Moffat.

These investigators ran a leather belt on 6-in. steel pulleys and 6-in. cast iron pulleys on 15 ft. centers. The



This drawing shows how the arc of contact a belt running over a pulley can be increased from approximately 180 deg. to 240 deg. by running it slack.

slack belts are not practical. They say that one must have considerable tension in the slack side to make any belt pull full load. I am prepared to

belt traveled at the rate of only 895 ft. per minute and yet pulled 104.8 lb. per inch of width with a slip of less than 2 per cent. Was the slack



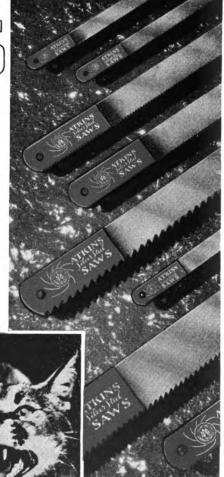
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side actually slack? Indeed it was. The belt sagged so much that the slack side almost touched the tight side, making it impossible to run the belt more slack. The tension ratio was 30, which means that the tension in the tight side of the belt was 30 times that in the slack side. Or, in actual figures, the tension in the tight side was 104.8 lbs. and in the slack side 3.49 lb. per inch of width.

My sketch herewith shows one important advantage of running belts slack. The black areas show the increased arc of contact that is obtained by running the belt slack. The dotted line shows where the belt would be if it were tight. In this instance if tight the arc of contact on each pulley would be only 180 degrees. By running the belt slack as shown, we have a total of 240 degrees. Since pulling capacity increases as a power of the arc of contact multiplied by coefficient of friction it becomes clear why slackness is possible and also why slackness is desirable.

The chief requisites of slack belt drives are: (1) a high coefficient of friction between the belt and the pulleys; (2) good shaft and pulley alignment; and (3) a steady load. If the load is variable, such as is common with compresser drives or hammer drives, extreme slackness without the use of a wrapper pulley is inadvisable owing to the flapping of the belt that is sure to result. A wrapper pulley, however, will eliminate all flapping and generally is a "good thing" en any drive.

Machining 13 Surfaces

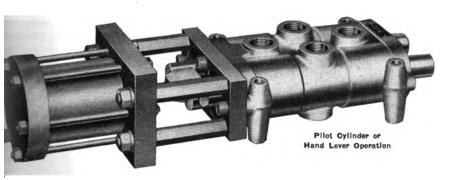
(Continued from page 130)

through the connecting plug expands the arbor whose serrated jaws grip the work from the inside.

Using both the square and hexagon turrets, as many as 13 surfaces are machined on one setting of the work, accurate to within one thousandth.

NEW!

Q. A. W. HYDRAULIC CONTROL VALVES



2-way-3-way-4-way-1/2", %4", 1", 114", 11/4" and 2", for Hand Lever er Pilot Cylinder Operation in two types—for 1000 pounds working pressure and for 2000 pounds working pressure. Housings of heavy bronze forgings or machined from solid steel slab. The simplicity of the Q. A. W. Valving principle and extremely rugged construction make these valves a real insurance against tie-ups and shut downs. Valving action is accomplished by only one moving part in the 2-way valves, and by co-incident mevement of only two valving plungers in 3-way and 4-way units. Piping Connections above or below. Inspection without disturbing the piping. Proven in strenuous tests in the hardest kinds of service. Long use with virtually no unkeen.



NO METAL-TO-METAL CONTACT

Built on the Q. A. W. principle of No Metalto-Metal wear in the valving action, stainless steel plungers. short travel, and balanced a ction, these new valves offer extremely long life in hard service. Inspection and re-assembly in a few minutes.

NEW CATALOG Write for complete new catalog of Air and Hydraulic Valves. "1 M" (key)

Over the Editor's Desk

Competent Supervision

THE article on page 74 of this issue describing the manner in which foremen's conferences are conducted at the plant of the Crosley Radio Corporation should be of interest to the managing executives of every modern plant, especially where there is no foreman training program at the present time.

The advance of civilization as evidenced by the development of all kinds of accessories to better living has developed a demand for shop executives of a better class than had previously been considered necessary. years ago the first requisites of a good foreman were mechanical ability and sufficient intelligence to get the work out on schedule. Many of the foremen, superintendents, and other manufacturing executives boys, taken machine shop jobs due to economic necessity and in many cases these men were without so much as grade school educations.

The new foreman having been placed in charge, the job was "up to him." If he had difficulties with his men, or with his equipment, or with anything else involved in the operation of his department, it was his problem. If he had faults, they were usually condoned as long as he could produce accurate work on schedule time.

Modern industrial methods necessitate supervision of a higher type. It is not enough that the foreman know how the work should be done; he is expected to know enough about tool materials and design to know whether tool performance in his department could be improved, enough about the equipment available in the market to know whether his production could be improved, enough about materials to

make suggestions regarding manufacturing methods, and enough about managerial functions so that he can keep his department running smoothly.

Information on all of these subjects except the last one is available through books and the technical magazined Many books have been written on management, but there is nothing that will educate a man along this line quite as well as hearing his problems discussed by other—and perhaps more experienced—executives in his own plant or his own industry.

The conference method of foreman training has long been recognized at the most effective method of developing first-class executives and we shall be very glad indeed to supply additional information on this subject to any factory executive who is considering the inauguration of a foreman's conference.

A Slight Error

N our discussion of the manner in which Social Security funds which Social Security funds are being handled, which appeared on the editor's page in the September issue of this magazine, we state that "withdrawals for Social Security pensions have already begun." We were in error; pensions are being disbursed in our own state of Ohio from the state pension fund, but the national Social Security pension payments will not start until 1942. However, the fact still remains that-according to the Hon. Dudley A. White of Ohio-the Social Security tax money is being used for current expenditures, government bonds being deposited by the government to take the place of the tax monies. And we are still interested in knowing where the money is going to come from to redeem these bonds.



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New Shop Equipment

South Bend Pedestal Adjustable Motor Drive Lathes

The South Bend Lathe Works, 979 East Madison St., South Bend, Indiana, announces a new design of back-geared, screw cutting, precision lathes in the Pedestal Adjustable Motor Drive. The

South Bard

South Bend Pedestal Adjustable Motor Drive Lathe

new drive is available in the five sizes of South Bend Precision Lathes—9 in., 11 in., 13 in., 15 in., and 16 in. swing, and in bed lengths from 3 ft. to 12 ft.

The pedestal adjustable motor drive mechanism is a separate unit with the motor and countershaft mounted on a pedestal back of the lathe in a position horizontal with the headstock cone pulley of the lathe. Power is transmitted from the motor to the countershaft by V-belts, and from the countershaft to the lathe spindle by flat leather belt, providing a smooth, steady pull, free from vibration and chatter. The reversing switch is conveniently located near the lathe spindle and permits the operator to start, stop and reverse the rotation of the lathe from an easy work-

ing position. An adjustable tens brace between the countershaft and lathe equalizes the pull of the belt.

A belt tension release lever permeasy shifting of the cone pulley be from one step of the pulley to anoth when the lever is pulled towards operator, the motor drive is tilted for

ward on its pivoti frame sufficiently easily shift the spin belt. The V-belts in the motor to count shaft are enclosed in substantial guard.

Several new features the pedestal motor dr include: Motor entir apart from the lat thus eliminating vib silent belt dr providing a smooth stee pull; no overhead be to obstruct vision or cast shadows on t work: V-belts from m tor to pulley enclosed a guard; screw type b tension adjustment any desired pull power; and release shifting belt to char spindle speeds.

The new lathes have number of new featu and improvements, most outstanding which are: Heat-treat

which are: Heat-treat headstock spindle with all bearing st faces hardened and ground, includithe taper hole; spindles are special all steel, with phosphor bronze bearing line bored and lapped to a perfect being and adjustable for wear; new down wall apron with self-oiling steel ges and all gear shafts supported on beends; a multiple disc friction clutch apron, and so on.

South Bend Pedestal Adjustable Med Driven Precision Lathes are built in be the quick change gear and stands change gear types. Quick Change Garbane are equipped with a quick change decharation for cutting 48 right and shand standard screw threads range from 2 to 112 per inch, including 15 pipe thread. Standard change garbane properties of the propertie

es are equipped with a set of loose age gears for cutting right and left d screw threads from 2 to 40 per , including 11½ pipe thread.

natool Bolender Gear Burnisher

new Bolender burnishing machine improving and truing up the surfaces ear teeth is announced by the Cima-

Company, 3rd St. at e, Dayton, Ohio. While it of the basic features the original Bolender hines have been reed, the new unit incorties so many important rovements that it does bear much resemblance ts predecessors.

he characteristics of this hine which make it parlarly attractive in the of gear finishing are greater ease and speed oth set-up and change-(2) higher production d, (3) better control of sure between gears, and ter range of pressure lable, (4) greater accuin alignment between ter burnishers and work

hese advantages have accomplished by addis and rearrangement of hanical elements in regning as follows:

 and control. (9) New dual push button control.

The new machine accepts gears within the size range of 1½ in. to 20 in. in diameter.

A new, wider and more rugged slide carrying two idler burnishers is fitted with a rapid screw adjustment for positioning. The upper bearing support for each of the two idler burnishers and



Cimatool Bolender Gear Burnisher

the master burnisher is mounted in a swing arm which permits easy access in change-over from one job to another. The work arbor has a rapid and fine adjustment provided for vertically positioning the gear to be burnished. Its lateral adjustment is accomplished with equal ease.

Operating pressure, that is the pressure between burnisher and work gear,



HAMILTON ELEVATING TABLES

Save time and money in lifting and handling heavy dies, tools, etc., in your tool room or stamping shop. All steel construction—anti-friction bearings—furnished with hand or electric power. Special tables built for your requirements. Write for illustrated circular.

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TOOL OF 1001 USES

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HERE'S the wonder tool that is effecting such revolutionary savings in many laboratories, model and tool rooms and on production lines. Hard-to-get-at places on machines can now be repaired without removing the part or dismantling machine. Handee uses 200 different accessories, instantly interchangeable, for work on all metals, alloys, bakelite, celluloid, wood, glass, resins and other hard substances.

Finest, speediest, most powerful tool for its type. 25,000 r.p.m. AC or DC, 110 volts. Weighs only 12 ounces. No shop or factory can afford to be without the Handee. Try one.

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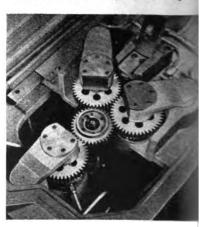
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H	Send	De	Luxe	Handee	on	10-Day	Tria

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is easily controlled without the use separate tools. A dial pressure shows the actual pressure between t gears at all times. Because of the cial V-belt drive, speed changes easily and quickly attained.

Four large louvred doors provide quate cooling of motors, pumps, piping, all of which is totally end and protected within the base of machine. The in-built coolant reser is easily accessible and may be cles out simply by removing one of the st on doors.

A conveniently designed cover provi



Cimatool Bolender Gear Burnishing Mechan in Operation

adequate space for loading and unlo ing the machine and at the same t prevents the coolant from splashing

A sight gage informs the operator at times of the exact level and flow of bricant in the drive compartment. D push button control provides maxim safety.

Partool 8-Spindle Horizontal Rotary Lathe

Machine Company. Partool Schaefer Highway, Detroit, Mich-just completed the special 8rotary horizontal lathe shown illustration. The base is of factorial steel, 93 in. in diameter. Upon 1 is mounted a large anti-fricti bearing which carries the large I head, assuring smooth operating and

Spindles can be arranged either



Allis-Chalmers originated, developed and pioneered the multiple V-Belt drive principle, and has conceived and developed all its improvements and variations such as the Duro-Brace and Vari-Pitch Sheaves and the Straitline Automatic Ball Bearing Motor Base. When you buy Texrope Drives you are buying drives that have resulted from vast experience and are produced by the most complete and up-to-date manufacturing facilities.

Before buying a multiple V-Belt drive consult multiple V-Belt headquarters—Texrope Division, Allis-Chalmers Manufacturing Company.

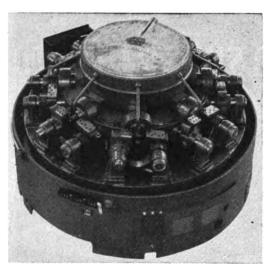
Write for Vari-Pitch Bulletin No. 1261-A and Duro-Brace Bulletin No. 2188-B

Belts by Goodrich

TEXROPE DIVISION

ALLIS · CHALMER

citized by GOOGE



Partool 8-Spindle Horizontal Rotary Lathe

plain or anti-friction bearings to suit

condition of work which it is required to perform; the tool blocks are mounted on large diameter shafts tassure rigidity and are an actuated. The work holders at designed to automatical clamp the part before maching and unclamp the part at machining.

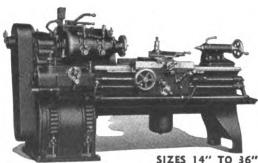
This particular machine w designed to machine univers joint flange bodies, and open at 900 cycles an hour. All n ciprocating parts have fore feed lubrication from one es tral oiling system. The cooks is pumped up into the rese voir located on the top of the machine which feeds cooks to the work in ample quantit There is ample provision made for removing the chips; as the machine revolves they a dumped out the rear of the machine into a container.

Weight-16,000 pounds.

Hisey Two-Wheel Wet Grinder

The Hisey Two-Wheel Wet Grind made by The Hisey-Wolf Machine C Cincinnati, Ohio, and illustrated her

Highest Quality in every detail in your BOYE & EMMES LATHE



Over 40 years of exclusive lathe building experience, coupled with the consistent use of only the finest materials, has enabled BOYE & EMMES to build lathes which in many cases are still giving accurate, steady service after 35 years of hard use.

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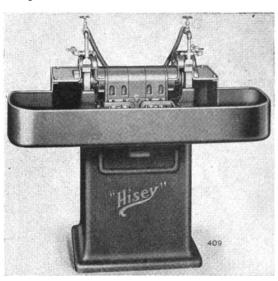


MIGILL MANUFACTURING CO.

1500 North Lafayette Street VALPARAISO, IND.

with, is made in three sizes for 10, 12 and 14-in, wheels. The machine is designed to use motors of any electrical characteristics. Through the use of the V-belt drive, the correct spindle speed is always available and can easily be changed when desired. Provision is

however, before returning the water to the reservoir. The flow of water is controlled by a convenient valve on the top of the guard. The separator is badly removed for cleaning. The pump is self-priming and is driven by a V-belt from the spindle.



Hisey Two-Wheel Wet Grinder

made for supplying a constant stream of coolant direct to the work.

The advantage of a wet grinder of

The advantage of a wet grinder of this type is the elimination of dust, which makes for healthier working conditions and saves the cost of a dust collecting system due to the fact that the stream of water carries with it all dust and grit. A separator removes all grit,

Model 10A Reed-Prentice Plastic Injection Molding Machine

The illustration shows the new Model 10A Reed-Prentice Plastic Injection Molding Machine which has been brought out by Reed-Corporation Prentice Worcester, Mass. In signing this machine, a number of improvements have been included such as improved timing units and push location of timers. buttons and dial for easier operation. A shut off valve is supplied for the oil gages The valves will be closed and opened only when checking the pressure. The push button station has been relocated and redesigned with a selector switch and dials for single cycle or automatic operation. Pilot valve levers now hav? a safety mechanism which eliminates danger of acci-dentally operating the ma-

chine.

The stationary die plate is cut from solid steel plate and the thickness has been increased to 4% in. The movable die plate has been increased in thickness to 4½ in. Improved ribbing of the die plate and longer bearing on the tie bars of 10¼ in. is regularly furnished. The plate is equipped with a bronze

WALES DIES

HOLE PUNCHING

EASILY ARRANGED FOR MOST GROUPINGS IN FLAT SHEETS WILL PIERCE UP TO 7/8 DIA. IN 14 GAUGE

Write for Catalog 5.

THE STRIPPIT CORP.

1559 NIAGARA ST. BUFFALO, N. Y.





● Independently owned warehouse stocks of Union Cold Finished Shafting, carried by more than one hundred and twenty-five warehouse distributors in the mill supply as well as the iron and steel jobbing field, afford prompt and capable service on Union Power Transmission Shafting.

For nearly fifty years, Union Drawn has made the closest study of all types of shafting requirements and has steadily improved the quality of this important material.

Cold Drawn and Ground as well as Turned and Ground Shafting are manufactured in addition to the more common Cold Drawn or Turned and Polished grades. Any analysis of carbon, alloy a stainless steel can be supplied. For complete details, write for "Shafting Handbook."

UNION DRAWN STEEL CO.

MASSILLON, OHIO

MEMBER OF POWER TRANSMISSION COUNCIL



to give greater capacity. The unit is longer, of same diameter and the torpedo has circular holes rather than slotted holes, eliminating the trouble of light colors lodging in the corners and burning. The machine is also equipped with a heating unit on the nozzle that can be shut off when the machine is functioning, eliminating trouble due to material solidifying in the nozzle. Timing con-trols with dials have been improved with larger capacity rotors in the timers for more de-pendable operation. The machine is also equipped with a Nitraloy material plunger and a Nitraloy sleeve in the plunger cylinder, eminimums possibility of scoring. The pump, which is of larger capacity than heretofore, only requires 15 h.p. for a period of two seconds during the injection cycle. For the rest of the complete machine cycle, only an average of 7½ h.p. is necessary to operate the pump.



Shaw Model M Printer

Shaw Model M Printer

The Shaw Model M Printer illustrated herewith has been designed and built by Shaw Blue Print Machine Co., Inc., 11 Campbell St., Newark, N. J., to meet the demands for high speed in reproducing blue prints or black and white prints. The features of the machine are speed and economy. The printing speed of the machine can be varied within a range of

from 9 in. to 12 ft. per minute. The machine employs only three arc lamps of high actinic rays, using ½ 19-in. carbons. Globes are of pyrex. The lamps are designed so that the arcs will burn steadily for over 45 minutes before breaking and require trimming only every eight hours of continuous burning.

The frame of the machine is of all steel arc welded construction and is housed as shown with heavy sheet steel. The housing finish is olive green wrinkle, which is lasting and pleasing in appearance.



STEEGE Junior Motor Drives

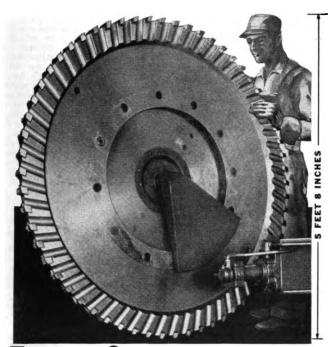
Adaptable to Any Cone Pulley Machine!

Give higher production at lower cost—are simple and easy to operate—pay for themselves in savings. Send for catalog.

PRICED FROM \$35.00 UP

W. L. STEEGE MACHINERY COMPANY

21 S. CLINTON ST. CHICAGO, ILL.



THIS 5 FOOT 8 INCH FIRTHITE CUTTER

HAS 64 FIRTHITE BLADES

CILYWOOD" superlatives are required to properly describe this truly huge Ingersoll Milling Cutter which is equipped with 64 FIRTHITE tipped inserted blades. This is probably the largest Carbide Tipped face milling cutter ever assembled. Its outside diameter is 68 inches and it slabs aluminum ingots up to 66 inches wide. A 150 H.P motor drives it at 3000 ft. per minute. Removing 3/16" of stock per pass at feed rates up to 72" per minute. 60 blades do the roughing while 4 blades set 90 degrees apart and aheed on the face on a smaller diameter do the finishing. These 4 finishing blades have wide

faced FIRTHITE tipped cutting edges to sweep the milled surface smooth and flat to prepare the ingot for the subsequent rolling and drawing operations.

This cutter effectually proves that size imposes no limitation on the use of FIRTHITE Sintered Carbide tipped tools. FIRTHITE helped make this unusual application possible. FIRTHITE also helps to make all cutting tools from single point turning tools to intricate fluted types more efficient and durable.

Write for price list giving new lower prices on tools, bits and tips.



WORKL MCKEESPORT, PA.
NEW YORK CHICAGO
HARTFORD PHILADELPHIA
LOS ANGELES DETPORT
CLEVELAND DAYLON
GLOBE WIRE GIVENION
MICKEESPORT, PA

The machine is powered with a 1/2 h.p., 1750 r.p.m. constant speed motor. An infinite variety of speeds is available through the use of a special Reeves Variable Speed Drive and Control. A special shift lever, convenient to the operator at the front of the machine, provides two speeds: high, low and neutral. Individual switches for each lamp, motor and fan are on the left side of the machine. A start and stop switch is also located at the right side of the machine within easy reach of the operator and the speed control with speed indicator for setting at the speed required is also located at this side of the machine. An asbestos curtain serves an additional light shield to further assist in controlling light exposure. Lamps are cooled by a fan mounted on the left side of the machine.

The contact glass is curved in a semicircle providing a printing area 11x48 in. in size, which is ample to care for 42-in. tracings. The contact glass is sulphur free and clear white, and will pass 20 per cent more actinic ray than ordinary place glass. The glass can easily be swung into position for cleaning.

The feeding table is 18 in. wide. A foot treadle located at the front of the

machine permits the operator to retension on the endless canvas bar that a tracing may be withdrawn The band is quickly adjusted ! creep by simple adjustment OFF. roller. The tension on the band to maintained at all times by a specially designed lever and heavy spring arran ment. Oilite bearings are used on shaft and bearing points, in addition to which an oil cup is provided at cach bearing, making it necessary to lubricate the equipment only once a year. The reduction gear unit is housed and runs The 42-in. machine is 65 in. in oil. wide, 41 1/2 in. deep and 67 in. high, and weighs approximately 650 lbs. Machines of 54-in, sizes can be built on special order.

Linley High Speed Vertical Bench Milling Machine

For use in the making of dies, fixtures, patterns, tools, molds, and other similar work of a precision type, the high speed vertical bench milling machine shown in the illustration has been brought out by Linley Brothers Co., 583 Fairfield Ave., Bridgeport, Conn. The machine has been designed for the maximum flexi-





Toll of Tradition
... GO MODERN WITH

YALE HAND LIFT TRUCKS

It's not so long ago that lumbering stagecoaches clattered over the highways, paying tribute at every toll gate. The most efficient mode of travel then known—NOW relics of a picturesque past... Because time works changes that make the efficiency of yesterday ineffectual today.

That's the price of progress—the reason that materials handling methods which may have brought results for years, fall down when compared to modern systems. One simply has to keep up with the times or pay the Toll of Tradition—excess overhead that bites deeply into profits.

Perhaps therein lies the answer to YOUR cost problem. If so, you can solve it with Yale.

The YALE HAND LIFT TRUCK AND SKID PLATFORM SYSTEM is the most modern in its field. It combines the four features of Safety—Speed—Efficiency—and Economy to the Nth degree... Brings

The "Red Streak" 3,500
lb. capacity—Single
Stroke Hand Lift Truck



RUGGED FRONT END CONSTRUCTION
—Front wheels equipped with over-capacity
roller bearings mounted on axle of high carbon chrome manganese steel. Axle key eliminates wear—hardened steel thrust washers
on either side of wheels assure maximum life.

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For quick, positive clamping and instant release, where pressure is required to hold firmly and accurately as for welding, drilling, machining or assembly operations use

DE STA CO

for Holding Production Parts

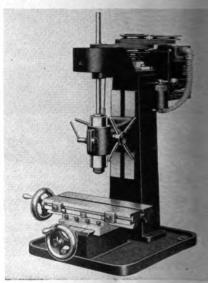
Slight movement of handle firmly clamps the part under pressure — an easy pull quickly raises clamping bar clear of work. Operates quickly and holds firmly without slippage or side sway.

Twenty four standard styles and sizes to select from, all moderately priced. Send for literature.

DETROIT STAMPING CO. 3449 FORT ST., WEST, DETROIT, MICH.

bility and accuracy and each machine is thoroughly tested before shipment.

The working surface of the table is 14½x5½ in. and has a ½-in. T-slot through the center. The longitudinative of the table is 10 in. and the cross travel is 5 in. Table, saddle and bed ways are hand scraped and securely gibbed for extreme accuracy and rigidity. The screws are fitted with replaceable bronze nuts and are equipped with largedials graduated in thousandths. An adjustable stop gage is provided for longi-



Linley High Speed Vertical Bench Milling Machine

tudinal adjustment and the saddle can be locked in position.

The spindle has a vertical travel of 3 in, and can be locked for milling operations. The spindle is equipped with Ultra-Precision Litro Norma-Hoffman Preloaded Ball Bearings of ample size for long wear, and the spindle pulley runs on separate ball bearings. belts are used on a compound drive which gives eight spindle speeds of 275, 430, 550, 860, 1250, 2125, 2500 and 4250 r.p.m. The intermediate pulley runs on ball bearings and is adjustable for belt The spindle is designed for take-up. collets which can be furnished in sizes up to and including 1/2-in. to take small straight shank mills. A special collet is furnished for No. 5 B & S taper shank

More than \$2,000,000 worth of

MO-MAX

Molybdenum-Tungsten High Speed Steel

is being consumed this year. The consumers have shifted to MOMAX for quality and quantity production because they have found it makes better tools. These facts prove that MOMAX has established itself as a superior high speed steel. Its use in the plants of consumers has demonstrated that—

- MO-MAX requires 8% less weight of steel to make a tool.
- . MO MAX is easy to weld
- · MOMAX is easy to forge.
- · MOMAX is easy to machine.
- . Mo MAX is easy to grind
- MO-MAX tools are harder.
- MOMAX tools are tougher.
- MOMAX tools have superior cutting quality.

Leading steel companies in North America and Europe are now licensed to make MOMAX. A booklet giving the essential data may be obtained by addressing The Cleveland Twist Drill Company, Cleveland, Ohio.



Shift to MO-MAX for Quality and Quantity Production

MOMAX is a proprietary name owned and controlled by The Cleveland Twist Drill Company and its only licensed use by others is on steel made and sold by licensees under U. S. Patent Nos. 1937,334, 1,998,953, 1,998,954, 1,998,955, 1,998,955, 1,998,957, and Canadian Patent Nos. 346,506, 364,032 and 364,033.

934

1935

1936

1937

The sliding head has a movement of 8-in. and in an upper position allows 11 in. between the spindle end and the table top. The motor is mounted on an adjustable bracket to allow for belt take-up and a reversing switch is provided to operate the motor in either direction for right and left hand mills. Standard equipment includes a ½ h.p., 1725 r.p.m. ball bearing motor, either single phase, 60 cycle, 110 or 220 volt, or three phase, 50 or 60 cycle, 220 volt. Also included are a reversing switch, belts, one collet of any specified size up to ½-in. capacity, and one special collet for No. 5 B & S taper shank. Shipping weight, 300 pounds.

Motors having other characteristics can also be furnished, also foot treadle equipment for operation of quill travel can be supplied upon special order.

Jarvis Vario-Flex Flexible Shaft Machine

The line of flexible shaft machines built by The Charles L. Jarvis Company, Middletown, Conn., has been augmented by the addition of the "Jarvis Vario-Flex", illustrated herewith. The feature of this machine is that the surface speed of the grinding wheels can be main-



Jarvis Vario-Flex Flexible Shaft Machine

tained as the wheels wear down, due the fact that from 12 to 14 instant spe changes are available without stopping the machine.

The machine is powered by a totall enclosed ball bearing motor mounted a heavy duty cast iron base with lar rubber-tired ball bearing wheels.

- - - "MODERN" SPRING COLLET



FEED FINGER
COLLET TUBE
PUSHER TUBE
CHUCKING FINGER
EQUALIZING
FINGER HOLDER
ALLOY STEEL CAM

. . . and all other perishable pa and tools for screw machines. I scribed, illustrated and priced in a Catalog 33.

REBUILDING OF SCREW MACHINES

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ILLIONS bronze bearings in hundreds of different sizes that you need every day ... meeting every usual application in production and maintenance of all kinds of machinery. Electric Motor Bearings

... for service replacement in all makes of electric motors from 1/40 to 60 hp... made to exact original dimensions. ready for immediate as-

131 sizes of Machined and Centered Cored and Solid Bearing Bronze Bars . . . 13 inches long

... you buy no waste metal ... labor you save

Babbitt Metals for every purpose scientifically made to approved standard specifications. All these products obtainable at attractive

prices ... instantly ... at any time ... in any quantity... in all industrial centers and from leading mill supply wholesalers everywhere. The Bunting Brass & Bronze Company, Toledo, Ohio. Branches and Warehouses in All Principal Cities.



motor can be swiveled to any point in the complete 360 deg. circle. The shaft is equipped with a heavy duty handplece with two double-row ball bearings.

The machine is made in three sizes: 1, 1½ and 2 h.p. to deliver speeds of 2200 to 4700, 2000 to 4500, and 2000 to 4500. The two smaller sizes have ¾-in. diameter spindles and the large machine has a 1-in. diameter spindle.

Mastur Precision Boring Head

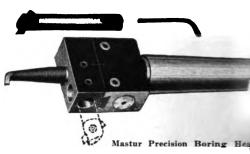
The Mastur Precision
Boring Head, product of P.
A. Maxwell Company, Bedford, Ohio, is small, compact and rigid, but, due to
the construction, has exceptionally large
boring capacity. The block and body
are of alloy steel, heat treated. The
tool block is dovetailed into the body
on a 30 deg. angle. All parts are ground.
The body of the tool is split between the

tool block and the adjusting screw hole,

making it possible, through the medium of two lock screws, to obtain any degree

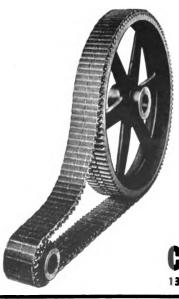
of tension on the dovetail slide. The ad-

justing screw and nut are of tool The screw head is graduated in 50 ions, providing for reading in 1 sandths of an inch on the screw



while the body is graduated to properly a vernier reading in two tents andths of an inch. Perfect alignis a feature of the tool, there being gib. Every working part is adjustable wear.

The tool is made in three sizes, i cated as Nos. 5, 6 and 7. The N is 7-in. capacity, the No. 6 is 1 capacity, and the No. 7 is 15-in. capa



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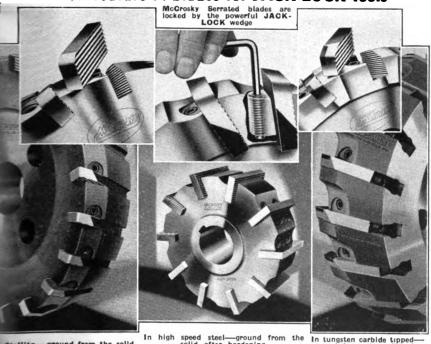
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CHICAGO, ILL

Mc CROSKY Tru-Ground

FROM

A new feature in blades for JACK-LOCK tools



Stellite-ground from the solid

solid after hardening

ground from the solid after

cCROSKY TRU-GROUND Serrations produce an improved design of blade that meshes more perfectly with body serrations and adjusts more easily. Each alternate tooth in the blade is omitted, but no teeth are omitted from the slot serrations (compare blade and slot errations shown above). By the TRU-GROUND method truer serrations can be ground in tellite at reduced cost; warpage of serrations in high speed steel is eliminated; tungsten carticles are leaded more visible. TRU-CROUND Server is eliminated. ide tipped blades are locked more rigidly. TRU-GROUND Serrations are used exclusively in leCrosky JACK-LOCK milling cutters and special-purpose serrated tools. Ask for Bulletin

be design of McCrosky TRU-GROUND Serrations and the method of producing them are covered by patent applications.

McCrosky Tool Corporation, Meadville, Pa. Offices: Chicago, Cleveland. Detroit. New York, Philadelphia

3 NEW VALVE GRINDING COMPOUNDS

PROM a varied line of scientifically made SPECIAL Valve Grinding Compounds developed originally for individual mfgrs. of R.R. Rotary & Slide Valves, Diesel, Automotive, Refrigerating equipment, R. & Motor Bus Air Brake Valves, we invite your attention to 3 grades of compounds that are expressly made for the grinding of Angle Cock and other types of Cock Valves; both new and reconditioning grinding.

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Serrated Blades with McCrosky Tru-Ground Serrations

A serrated blade with serrations ground from the solid instead of hobbed is announced by McCrosky Tool Corporation Meadville, Pa., for use in inserted serrated blade tools.

Serrating by grinding has always been the only possible method for an unmachineable alloy like Carboloy, but this method has been too difficult and expensive to be practical for use on high



McCrosky Tru-Ground Serrations in a Hig Speed Steel Blade Showing Phantom Viet of McCrosky Jack-Lock Wedge

speed steel blades. Only one serration could be ground at a time, and the grinding wheel had to be dressed ofter to maintain the sharp V form and to produce uniform angle and pitch.

To overcome these manufacturing difficulties, McCrosky has developed a new form of serration and a new method of grinding serrations. The main principle of the development is to avoid the sharp V form of grinding wheel necessary to produce the sharp V form of groove between two adjacent teeth in the conventional type of hobbed serrations. This has been accomplished by omitting every alternate tooth. The resulting McCrosky serration pattern has a flat-bottomed groove between the teeth that does away entirely with the sharp V ridge on the periphery of the grinding wheel. The McCrosky method also permits a series of serrations to be ground at one time.

Omitting every other tooth in the blade does not change the adjusting in-

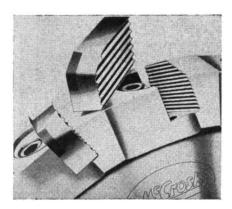


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McCrosky Tru-Ground Serrations in Tungsten Carbide Tipped Blades

crements of the assembled tool. No teeth are omitted from the table slot, and the blade can therefore be moved out from one serration to another as in the tool with conventional blade serrations. The accompanying illustrations show the relation of McCrosky blade and body serrations. The smoothly ground,

accurate serrations on the blade quickly find their mating serrations in the alot and save time in assembly or adjustment.

McCrosky Tru-Ground Serrations ofparticular advantages for high speed steel blades. By the conventional hobbing method serrations are generated in the soft high speed blade blank be-fore hardening. The hardening process tends to warp the blade and scale the serrations. The result is an imperfect meshing of blade serrations in slot ser-rations and therefore a poor bearing. McCrosky Tru-Ground serrations eliminate this danger completely because serrations are ground from the solid after hardening.

Applied to Stellite, the McCrosky design and method produce truer and more uniform serrations at less cost than by the slower method of grinding one serration at a time. Applied to blades tipped with tungsten carbide, the McCrosky principle insures greater rigidity in the assembled tool by providing a perfect bearing between the blade and body serrations.

Blades with McCrosky Tru-Ground Serrations will be used exclusively in McCrosky Jack-Lock Milling Cutters and special purpose tools. The design of

IT'S PRECISION BUILT .the C-O 21" Sliding Head Drill

Here's a typically accurate, fiexible, yet larger C-O Drilling Unit for high production drilling of large holes. Self-feed and back gear attachments provide a wide range of speeds and feeds.

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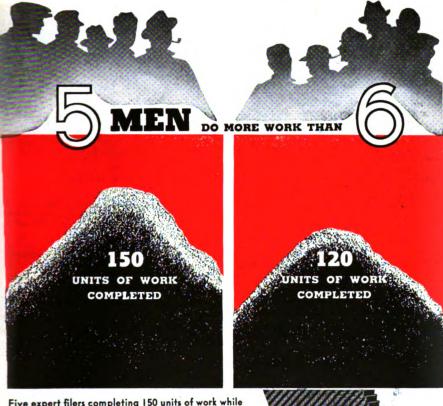
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McCrosky serrations and the process of producing them are covered by patent applications.

Brown & Sharpe No. 2C Cam Vise

The time required to clamp work in a vise on a milling machine, drill press or shaper table, can be reduced to the minimum by the use of the

minimum by the use of the Brown & Sharpe Cam Vise illustrated herewith, product of Brown & Sharpe Mfg. Co., Providence, R. I. The movable body can be set to provide the opening required for the work by means of a heavy square threaded screw and mut. With the jaw properly set, the work is clean.

erly set, the work is clamped and unclamped by a simple, short horizontal movement of the lever. The force applied by the lever is multiplied many times by the cam, imparting a powerful clamping force.

The movable body is gibbed to the slide by straps which are protected from chips and dirt. The fixed jaw is a one-piece semi-steel casting. Jaws and other steel parts subject to wear are hard-ened and ground and the jaws are inter-

changeable. The bearing surface extends the full width of the vise body, permitting work to withstand the pressure of the cut at the extreme ends of the jaws with the least tendency to pivot or shift vertically.

Tongue slots at right angles permit the vise to be set either lengthwise or at right angles to the table. A revers-



Brown & Sharpe No. 2C Cam Vise

ible tongue is provided for either H or H-in. slots. The jaws are 5% in. wide, 1% in. deep, and open 2 in. Weight. 42 pounds.

Barber-Colman Type S Automatic Hobbing Machine

For the high speed continuous hobbing of spur gears and pinions of the type used in small precision instruments, Barber-Colman Company, Rock-



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The Pump that Pays a Profit

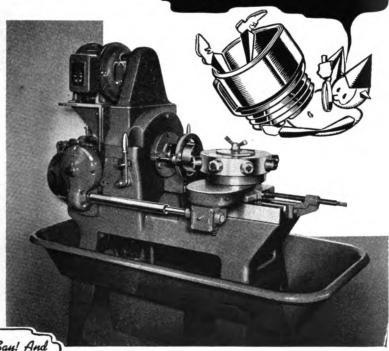
When you buy a coolant pump you look for quiet, uninterrupted and economical service. That's smart buying.

The ball bearing design of the Ruthmen "GUSHER" Pump minimizes friction and increases efficiency—to give you maximum service.

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I'll Say! And we gave them 1200 threaded pieces per machine every hour. That's production, Pitch, old boy!

PITCH has his glass on a little electrical connector.

A few months ago it was just a problem—a sample sent to

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threaded pieces per hour.

The R & S Threading Machine that spits out threaded connectors is automatically indexing, manually loaded and cam

controlled. The cam controls the pitch.

Mail your production threading problem in the form of a sample piece—give us thread specifications and data and we'll give you production plus. Let's have it folks.

The RICKERT ERIE,

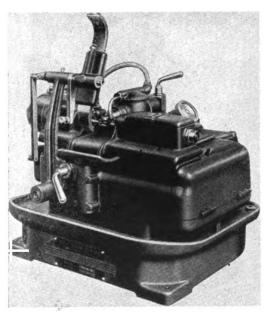
Adjustable Boring Heads; Collapsible Taps Solid Adjustable Die Heads; Chasers; Self Opening Die Heads; Solid Adjustable Taps

SHAFER Co.

Tapping Machines, Automatic Cut-off Machines
Automatic, Single Purpose
Threading Machines.

174

ford, Ill., has developed an automatic hobbing machine to be known as the Type 8. The machine will hob spur gears and pinions or similar work up to 1-in. diameter by ½-in. face.



Barber-Colman Type S Automatic Hobbing
Machine

The automatic cycle of the Type S machine includes work loading, rapid approach to the hob, feed, quick return, ejection of work, and repeat. The machine is easy to set up and after once being set, the operator merely keeps the magazine loaded. The machine can,

however, be hand loaded and operated as a single cycle machine. Adjustments for variations in work are said to be few and simple.

The base is of sturdy, modern design and is built integral with an apron to catch coolant and chips. The machine can be supplied for bench installation with pedestal for single installation, or base for battery of units. The tail spindle is spring-loaded and is in precise alignment with the work spindle. It automatically withdraws at the end of each cycle to release the work, then advances, moving a new workpiece from the magazine into the driving spindle. The heat treated and ground work spin-

sleeves, collets or bushings.

The cam-operated magazine automatically presents the work-piece to the spindle and holds enough blanks to allow the operator to service other

dle is tapered at the nose for

machines.

The hob spindle can be adjusted quickly and accurately to the lead angle of the hob by means of graduations and a vernier. A quick-acting clamp locks the spindle solidity. A knurled disk and disk with accurate, easy-to-read graduations facilitate adjusts; ment of the hob spindle the work of different diameters. A compression spring for work loading assures continuous reliable operation.

Change gears for index and feed are completely enclosed in a compartment with hinged cover. Compound index change gearing provides a wide and closely integrated range of ratios. Vertical adjustment of the hob is maintained positively by quick-acting clamp





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at the front of the machine. A worm gear meshing with a hardened and ground worm provides smooth, positive drive for the spindle. A feed cam governs the full automatic cycle including rapid approach of work to hob, feed and quick return.

A direct-driven pump floods every working part of the machine with a copious supply of lubricant. Coolant is circulated by a direct-driven gear pump which floods both the hob and the work. Machines arranged in batteries can be supplied with coolant from a central reservoir and pump. An automatic trip lever controls a one-revolution clutch that governs the work-handling mechanism. The switch is mounted on the motor for individual drive. A battery of machines can be driven from a single source of power.

The capacity of the machine, diameter, is 1 in. and the face is ½ in. Diametrical pitch brass, 24; steel, 32. Maximum travel of slide, 1 in. Hob diameter, minimum, ½ in.; maximum, ¾ in. Hob speeds, minimum, 500 r.p.m.; maximum, 1500 r.p.m. Number of hob speeds with gears furnished, 19. Number of feeds per revolution of work 19. Bench space required, 24x26 in. Motor, single phase, ½ h.p.,

1800 r.p.m. Weight, 340 pounds.

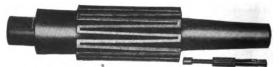
Landis Automatic Work Stop

The Landis Machine Company, Waynesboro, Pa., has designed an Automatic Work Stop for use on the Landmaco Threading Machine. The Automatic Work Stop may also be applied to all Landis standard threading machines employing a Model A carriage front.

The attachment may be used to excellent advantage where it is desired to locate stock in the same relative position for threading. It is particularly upplicable to operations where the thread is close to a shoulder, and where thread length, for each piece, must be maintained. The work stop is fully automatic in its action and materially improves production as time is saved by its use, particularly if there is a number of similar pieces to be threaded. A bracket fastened to the end of the carriage front supports a horizontal shaft on which a stop arm is mounted. The stop arm is adjustable on the shaft for any distance up to the length of the carriage travel of the machine.

The end of the shaft nearest the operator is fitted with a pinion gear

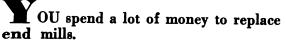
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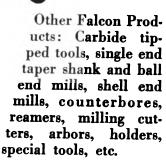
K. O. LEE & SON CO., Aberdeen, S. D.



The largest portion of this replacement cost is due to breakage and not to wear. FALCON engineers, through intensive research, have produced an end mill which will withstand far greater stress than was hitherto thought possible.

Neither wearing qualities nor proper chip clearance have been sacrificed to obtain this rugged end mill.

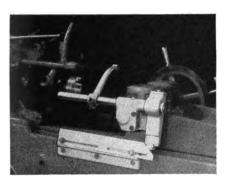
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THE FALCON TOOL COMPANY
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Landis Automatic Work Stop

that engages in a vertical rack gear. A cam fastened to the bed of the machine is used to actuate the movement of the stop arm as the carriage moves forward or backward. A roller on the end of the rack gear operates on the cam to reduce friction between the cam and the rack gear.

The cam has elongated slots that make it adjustable to any position. When the carriage is back or in position for loading and unloading, the stop arm is down. After the piece to be threaded is gripped in the vise, the cam is set so that the stop arm raises with the first forward movement of the carriage. This eliminates the possibility of the arm striking the head and causing any damage.

Rybeck Flexible Coupling

The T. L. Smith Company, 2831 North 32nd St., Milwaukee, Wis., is introducing a new type of coupling known as the Rybeck Flexible Coupling, which compensates for extreme conditions encountered in direct drives. The Rybeck Coupling is of full-floating, semi-universal joint design. The company claims it is the only one on the market that takes care of shaft misslignment, offset between shafts, end-play and shock, without increasing bearing loads. And it handles all four conditions even when present to an excessive degree.

According to the manufacturer, torsional load is transmitted through groups of laminated springs made of heat-treated Swedish spring steel. These springs are not subjected to any wear from endwise motion of the shafts, nor from angular or offset misalignment, since they are confined in a housing which eliminates any motion except de-

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flection. It is said the springs are stressed to only a fraction of their load carrying capacity.

Special alloy steel driving pins, heat-



Rybeck Flexible Coupling

treated, are pressed into steel hubs and fit into holes drilled into the torque sleeves. The sleeves are heat-treated to great hardness and are held in alignment by the housing which is securely bolted together. The housing also holds the springs in position between the jaws on the torque sleeves.

U. S. Power Driven Straightener

The great savings in productive labor. material cost and stock waste made possible through the use of coiled stock have led many metal fabricating concerns to adopt this more modern method of buying material. To take full advantage of all possible economies in this connection, these manufacturers require special equipment to automatically handle the colls of stock. The U.S. Company, Inc., Ampere, East Tool Orange, N. J., manufactures a complete line of automatic press feeding equipment, stock reels, stock straighteners and coil cradles, to handle coiled stock from coil to distribute the stock of the coiled stock from coil to distribute the stock of the coiled stock from coil to distribute the stock of the coiled stock of the c from coil to finished part.

The latest addition to the U.S. Tool line is a power driven straightener for heavy coiled stock. This unit used in conjunction with the U. S. Automatic Coil Cradle and U. S. Slide Feed provides a means of automatically removing stock from heavy coils, straightening it, and feeding accurate lengths to the punch press. Among the exclusive

NEW

U. S. No. 1 Anti-Friction Bearing

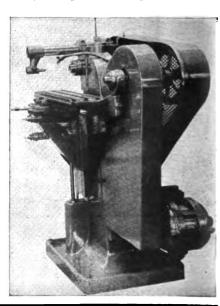
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features of the U. S. Power Driven Straighteners are: (1) All rollers equipped with needle bearings. (2) Simple, automatic roll adjustment, rolls alalways parallel. (3) New coil of stock may be inserted without disturbing setting of straightening rolls. (4) Single movement of operating lever releases

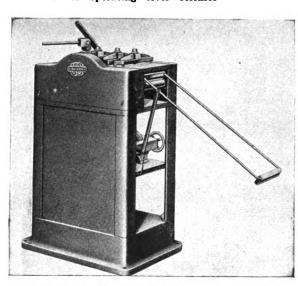
variable speed drive. They are mercoid switch controlled and operate intermittently to synchronize with the punch press feeds.

"Production" Small Electric Counter

The Production Instrument Company 1325 South Wabash Ave., Chicago, Illinois, announces new line of electrically - operated counters, adapted to economical built-in applications on a wide range of coin-operated machines production machinery and similar equipment The counter is unusually compact. The counter itself measures 1 1/8 x 1 1/2 x 1 1/4 in., and is mounted on 8 plate 2% in. square. The operating relay is attached below the base plate and extends 1% in below the surface.

The counter is equipped with large, legible number wheels, and black figures on a white background. The lightweight coined wheels require minimum driving effort resulting in long-lived, dependable recording. There are no spaces between number wheels are

tween number wheels, an additional feature which contributes to legibility. Five number wheels give a capacity of 99,999, which is ample for all requirements in small counters. The operation relay actuates the lever arm of the counter, which has a throw of only ½ in. Positive and dependable action prevents skips or overthrow of number wheels.



U. S. Power-Driven Straightener for Coiled Stock

feed rolls to start new coil. (5) Can be used in conjunction with U. S. Plain Stock Straighteners for handling thin, springy material.

U. S. Power Driven Straighteners are built in a number of sizes to handle stock up to ½ in. thick. Units can be furnished to handle any width stock. The straighteners are power driven, with

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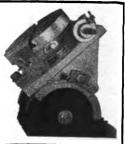
Suitable for adjustable angle machining by means of our 7½" Rotary Table, Vises or other holding fixtures.

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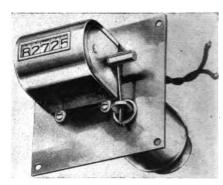
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ELIZABETH, N. J.





"Production" Small Electric Counter

The case enclosing the counter mechanism is of steel, designed to afford full protection to working parts. Since the case cover is fastened at the bottom, and Type SEC electric counter is a non-reset instrument, simple, tamper-proof installation may easily be made.

Brown & Sharpe Permanent Magnet Type Magnetic Chuck

Brown & Sharpe Mfg. Co., Providence, R. I., is now marketing (only in the United States) a magnetic chuck of the permanent magnet type as shown in the illustration. The feature of the chuck consists in that it requires no electrical connections, no wires, switches, auxiliary generators, or current supply. The chuck is entirely self-contained.

Magnets used in this chuck are of a special alloy and maintain several times more energy than permanent magnets previously available. The working surface and base are ground parallel and at right angles to the back. Both the ends and back are provided with removable stop plates which can be adjusted vertically to suit the requirements of various jobs. Moving parts are equipped with greaseless bearings.

The magnetic flux is controlled by the simple movement of a crank which changes the position of the magnets relative to the top of the plate so that work is either held or released. Work placed on the working surface is securely held when the crank is in the "on" position, and is released by a simple 180 deg. movement of the crank to the "off"

The chuck is well adapted for wet as well as dry grinding as it is completely sealed so that coolant cannot enter the



Brown & Sharpe Permanent Magnet Type Magnetic Chuck

internal parts. There is no external insulation to deteriorate from exposure to oil and coolant. The chuck is readily portable and is very useful as a bench tool for holding either small thin pieces or large pieces for polishing and similar jobs. The chuck is made in two sizes: the No. 510, which has a working surface of 5%x10% in., and the No. 618, which has a working surface of 6%x 10% in. The base dimensions are, respectively, 5%x11% and 6%x18% in.

Century Fractional Horse Power Motors

The Century Electric Company, St. Louis, Missouri, announces a new com-

plete line of fractional horsepower motors in sizes from 1/6 to % horse-power repulsion start induction, single phase, split phase, capacitor, polyphase and direct current.

This line is designed with interchangeable mounting dimensions for a given horse power size.

The fundamental principles are the same as have been used by Century for

been used by Century for many years, but many improvements have been added which can be appreciated only by inspection.

Bijur Lubrication Feed-Line Connection for Tight Places

An ingenious new type of tubing joint—the Bijur Drive Bushing Connection—has been devised by the Bijur Lubricating Corporation, Long Island City, N. Y. It provides efficient tubing connections on lubrication feed lines to bearings where space is very limited, and there is insufficient room for any type of threaded nut or conventional bushing.

The small tapered brass bushing em-

THE NEWEST DEVELOPMENT IN

METAL CUTTING MACHINES

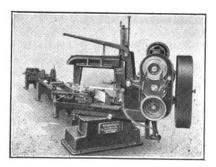
FULL AUTOMATIC—CAPACITY 10"x10" & 6"x6"

Stops when desired number of pieces have been cut. Length of cut is gauged by scale without end stop. Swivels on base for angular cutting.

Also built for manual operation.

RASMUSSEN MACHINE CO.

RACINE, WIS.



Send for circulars giving complete information.

ployed in this special connection has a center hole to slide readily over the particular size of the tubing used. This bushing is mounted into a shallow hole which is taper reamed. In the assembly operation, the drive bushing is placed into the mounting hole and the tube inserted as far as possible. Then, by means of a simple drive tool, one or two blows with a hammer will drive the bushing home. The taper fit causes the bushing to grip the tubing tightly and make an oil-tight and dirt-proof joint.

While adapted especially for use on lubrication feed lines of quite small mechanical units, the Drive Bushing Connection can be used in combination with any of the standard types of Bijur Automatic Lubricators and Meter-Units, in their various applications. It not only lends itself to the Bijur standardized equipment requirement of neat and compact production installation, but also bears out one of the most important features of the Bijur automatic lubricating systems; namely, an enclosed system from oil reservoir to bearings—the latter being thoroughly protected against dirt.

The new drive bushing joint helps to carry out this important principle even in tightest places. Tubing as small as

3/32-in. diameter can be connected in this manner. For such a size, the diameter of the drive bushing collar is only 3/16 inch.



Bijur Driving Bushing Connection comprising, left to right, Complete Tubing Connection (Enlarged), Drive Bushing and Tubing, Reamer, and Drive Tool



BEFORE

AFTER



NEW LIFE IN OLD TOOLS

... at a Saving of 20% to 60%

There's life in those old tools of yours! Don't throw them away.

The National Tool Salvage Company will grind them to their original accuracy, (retaining their temper) and guarantee them to be as good as new. Illustrations show a plain mill before and after recutting by the N. T. S. method at a saving of almost 60%.

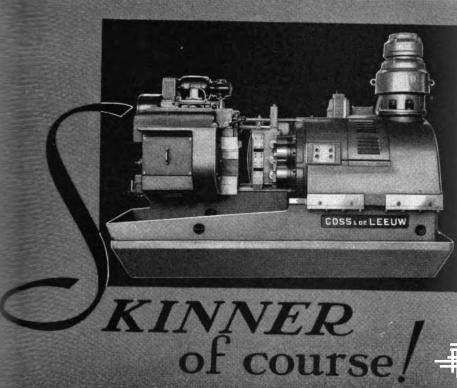
Write for prices and our 18 page illustrated catalog.

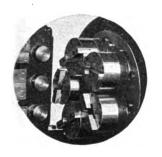
25 YEARS EXPERIENCE

NATIONAL TOOL SALVAGE CO.

DETROIT

MICHIGAN





Here's an unbeatable combination for speed and power... the new Goss & De Leeuw Multiple Spindle Chucking Machine—and its nest of five Skinner Chucks. These Skinner Chucks are built to take any load with a fast, sure grip, under any production pace. Weight and strength—efficiency and dependability are inherent in these Skinner Chucks. Holding power is more than ample for any set-up. As demonstrated by the choice for this machine, the safe Chuck specification is—Skinner, of course.

LATHE-DRILL AND
PLANER CHUCKS
VISES-POWER CHUCKS





does another job hetter

Because of the exceptionally low melting temperature of CERROMATRIX (250° F.) it can be cast against materials that would be damaged or destroyed by higher temperatures. This makes possible such applications as the one illustrated above, in which Cerromatrix, in order to provide a nest for a drill jig used on plastic parts (Bakelite, etc.) is cast against the part itself. An alloy of bismuth, lead, tin and antimony, Cerromatrix has peculiar properties that make it a useful metal for many uses. Expands slightly on cooling, tensile strength 13,000 lbs. per sq. in., Brinell 19. Among its useful applications are: matrix metal for locating die parts; models for engraving machines; anchoring parts in machine tools, etc.

Send for free Cerromatrix booklet.

CERRO DE PASCO COPPER CORPORATION

44 WALL STREET, NEW YORK, N. Y. British Associates: Mining & Chemical Products,

— Ltd., London, Eng.

Knu-Vise Drill Jig

The illustration shows a knuckle action vise drill jig designed for adaptation to a variety of work and placed on the market by Knu-Vise Products Company, 6430 Cass Ave., Detroit, Mich. The jig is intended for use on drilling, reaming, tapping, milling, and other operations where speed in the insertion and withdrawal of parts from the jig is essential.

The work is grasped by a jaw insert which is supplied as a blank and finished to fit the contour of the work; thus the jig can be used on as many



Model No. 325 Knuckle Action Knu-Vise

different jobs as there are inserts. Tremendous pressure is exerted by the clamping action which is controlled by the handle, movement of the handle through a 30-deg. arc being sufficient to open the jaws ¾ in.—which is enough for most jobs. The work is held rigidly and is easily and almost instantaneously loaded or unloaded. The vise jaws are case hardened and ground. The bushing plate and angle support bracket can be made by the customer or can be supplied upon special order.

Kingsbury Solenoid

Finding existing solenoids inefficient for the operation of the machine tools built by the Kingsbury Machine Tool Corporation, Keene, N. H., this firm perfected an A.C. solenoid for their own use. Since its development, the insistent call for Kingsbury solenoids for use in other machines has lead the Kingsbury Machine Tool Corporation to establish a department for the manufacture of these solenoids in quantity and to handle all



These strong, steel Bench Drawers can be easily attached to ANY bench. Handy for safe keeping of small precision tools, valuable blue prints and records—"Hallowells" have master-keyed locks (or padlock, if you prefer). They withstand rough usage, last much longer than clumsy wooden drawers, and never shrink, swell, stick or jam because of the weather.

Our Bulletin gives you details and prices.



STEEL TOTE PANS FOR EASY HANDLING AND STORAGE OF SMALL PARTS OR TOOLS

These welded steel tote pans are very sturdy, intended for heavy work and made to take lots of rough handling. They cannot break-up or become oil soaked like wooden boxes. The handles are cleverly clinched in place and cannot come loose. They're designed so that they can be stacked high without wobbling or toppling. Of course, they're fire-proof. Write for full information.

STANDARD PRESSED STEEL Co.

BRANCHES

JENKINTOWN, PENNA.

CHICAGO

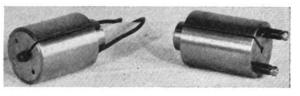
BOSTON DETROIT

INDIANAPOLIS

BOX 556

ST. LOUIS SAN FRANCISCO engineering work necessary for their proper application and mounting.

The Kingsbury Solenoid is cylindrical in shape, facilitating mounting and making a high degree of mechanical perfection economically feasible. As a result of the cylindrical shape, the sole-



Kingsbury Solenoid. (Left) Model 32-269 (Right) Model 150-1

noid is small and compact and is balanced magnetically.

The coil is wound directly on a phosphor bronze coil bushing between bobbin heads moided of a special high strength material. In winding a cotton interweave is used which is carefully and completely impregnated to gain maximum electrical and minimum thermal insulation. The coil is rigidly mounted in a steel case which protects it from mechanical injury and forms a magnetic

shield. The coil is wound in even layers and impregnated thoroughly with an oil and moisture resisting compound. Because of the nice magnetic balance and high grade bearing between plunger and coil bushing, operation is possible in any position with equal efficiency. The

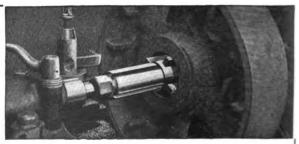
any position with equal efficiency. The construction admits the use of a magnetically shielded return spring which still further facilitates mounting in any position.

At the right of the illustration is shown the Model 150-1 Solenoid, the design of which is distinguished by terminal towers molded integral with the coil bobbin

fianges. The coll is wound between molded fianges, directly on the bronze bushing which forms the plunge bearing. The case is made from a low carbon steel bar slotted to minimize circulation of eddy currents. The case cap is screwed into the case, locking the coll is located by means of cylindrical rabbet fits on the ends of the bushing. The pole piece and plunger are of low carbon steel, multiple slotted to reduce eddy currents and

With NICHOLSON EXPANDING MANDRELS

you have available for immediate use internal chucks for holding any hurry-up break-down job that comes along. Can be used on lathes, grinders, shapers or millers. Take any bore—½" to 7". Made in fourteen sizes. Bulletin 530.



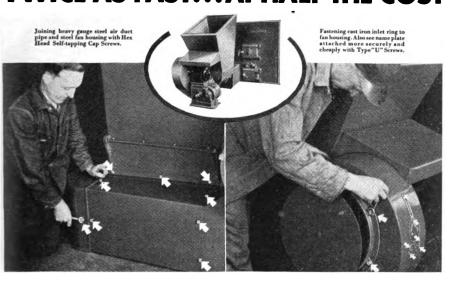
3 and 4-Way CONTROL VALVES for operating single or double acting air, steam, water or oil cylinders. Made in lever, foot, solenoid and motor operated. All pressures up to 3000 lbs. Bulletins on request.



Other Products: Arbor Presses, Flexible Couplings, Steel and Stainless Ball Floats, Steam
Traps and Separators, Air Separators, Traps and Vents, etc.

W. H. NICHOLSON & CO. 136 OREGON STREET, WILKES-BARRE, PENNA.

Here's how BROWNELL makes "heavy" assemblies TWICE AS FAST...AT HALF THE COST



Have a Parker-Kalon Assembly Engineer show where YOU can make better fastenings at lower cost by changing to Parker-Kalon Self-tapping Screws

These Brownell Stoker assemblies will interest any design or production men who is concerned with joining or making fastenings to heavy gauge steel. For these examples prove that it is possible to reduce costs, and at the same time, obtain great security.

The Brownell Co. actually cut costs in half, and doubled assembly speed on the jobs shown. And, they did it by the simple substitution of Parker-Kalon Hex Head Self-tapping Cap Screws for ordinary cap screws that required slow and costly tapping. In addition, it was found that the simpler, cheaper Self-tapping Screw method produced stronger fastenings.

For assembling steel plate and structural shapes up to ½ in, thick the Hex Cap type of Selftapping Screw proves ideal. It is also widely used for making fastenings to light gauges of sheet metal as well as die cast metal or plastic parts.

Whether your work involves heavy or light assemblies of metal or plastics... fastenings that can be removed and replaced repeatedly, or permanent fastenings... the chances are that one of the various types of Parker-Kalon Self-tapping Screws would do the work better, for less money. To learn just what could be accomplished on your assembly jobs is simple and does not obligate you. Just write us to have a Parker-Kalon Assembly Engineer check over your fastening requirements and point out possibilities.

PARKER-KALON CORPORATION
Dept. M, 198 Varick Street New York, N. Y.



chromium plated to reduce wear and minimize the effect of residual magnetism.

At the left is shown the Model 32-269, the distinguishing features of which are lead wires in place of terminals and—rating considered—the ultimate in compactness. The same general construction is used as in the Model 150-1, but special oil and water resisting lead wires are brought out through molded insulating bushings made integral with the bobbin flanges. This design, as in the 150-1, admits the use of a helical return spring shielded magnetically and supported by the spring guide. The spring has been carefully designed for a low fibre stress and to eliminate failure due to harmonics.

Economist Assembly Rack No. 48

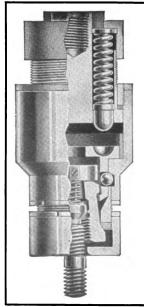
To aid in assembling small parts at the bench, the assembly rack shown in the illustration has been developed by Gordon L. Hall, Old Lyme, Conn. The maximum height of the rack is 8 in. and the front to back depth is approximately 12 in. Four standard lengths are available: 8, 12, 16 and 20 in. These four lengths make possible a wide range of



Model 48 Economist Racks Arranged for Use

flexibility in arrangement. The two sizes of containers or bins will fit all rack lengths and any 8-in. bin is interchangeable in any rack position with two 4-in. bins.

Single work places can be arranged for a maximum of convenience with hims varying in number from three 8-in. hims in a single 8-in. rack to 36 4-in. bins in three semi-circular 16-in. racks. Each bin is easily removed from the rack for refilling or emptying. The racks are finished in olive green.



TITAN STUD SETTER CONTROLLED DRIVE Assures Perfect Setting

The Titan Stud Setter has a safety clutch which controls driving power.

The Titan is positive in driving and automatic in releasing, thus making it possible to set the studs to any predetermined degree of tightness.

When the studs are driven to the specified tightness, the drive is automatically released and the tool may be removed without fear of mutilating or distorting the threads.

The great capacity, speed range, utility, and safety of this production tool make the Titan Stud Setter a profit-earning tool wherever it is used.

Write today for the new illustrated circular.

TITAN TOOL COMPANY

FAIRVIEW

PENNÁ

COMMERCIAL DROP FORGINGS . BOARD DROP HAMMERS and DIE MAKING MACHINERY

BILLINGS

THE BILLINGS & SPENCER CO.

HARTFORD, CONNECTICUT, U.S. A.

VITALLOY



WRENCHES

Billings latest contribution to wrench users—Billings Vitalloy Wrenches! The results of three-quarters of a century of forging experience, engineering knowledge combined with present day achievements of metallurgical knowledge and engineering skill—Controlled Grain Size Special Alloy Steel—to Billings specifications.

The recessed penel ("I" beam type of design) allows for a firmer and more



"Shop Tools" Book Write Dept. "O".

comfortable hand grip. Vitalloy Wrenches have a lasting triple-plated chromium finish. The same Guaranteed Quality you look for in all Billings Duo-Forged Tools are in these new Billings Vitalloy Wrenches—You'll like them!

Ask for BILLINGS VITALLOY Wrenches

LONGER LIFE in FORGED TOOLS

MARKING

FLAT—ROUND
IRREGULAR SURFACES
BY ROLLING
OPERATION



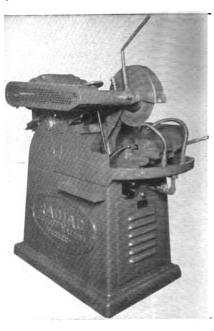
MODEL 25
HI-DUTY MARKING MACHINE

This machine operates from your plant alr line, and is one of numerous models built to produce fast, neat marking on metal parts. HI-Duty marking machines may be had for practically any marking operation, and we will be glad to make recommendations upon receipt of your inquiries. Send prints or samples of parts to be marked, showing lettering and location, also state required production.

GEO. T. SCHMIDT, Inc. 1806 BELLE PLAINE AVE. CHICAGO. ILL.

Radiac Type K Cut-Off Machine

A. P. de Sanno & Son, Inc., 1615 McKean St., Philadelphia, Pa., has added to its line the Type K Radiac Cut-Off Machine shown in the illustration. The Type K machine is an improvement on the Type J which is also made by this firm, and is arranged for both wet and dry cutting. The abrasive wheel spindle can be operated at either high or low speed, this fiexibility being accomplished



Radiac Type K Cut-Off Machine

by the use of a two-speed motor. The high and low speeds are selected through the operation of a crank handle on an electric controller box.

The cutting is accomplished by rubber bonded disks which are flushed with coolant at both high and low speeds. Resinoid bonded disks are used for high speed cutting and are operated both dry and wet. When using the wheels dry, a metal tray is inserted in the vise table to catch the dust.

The general appearance of the Type K machine is the same as the Type J and the general mechanical characteristics and capacity are identical.

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This is an actual photograph of a BLU-MOL Molybdenum hack saw blade on the job, and here's its actual performance record at the time the photograph was made:

MATERIAL—3% inch ber of Crescent Tool. Steel, analyzing 100-110 carbon.

SPEED-75 strokes a minute.

PRESSURE-125 pounds.

PERFORMANCE-152 cuts-1678 square inches.

The teeth were still keen, the set in excellent condition and the blade was still cutting true and fast. The operator estimated it was good for at least 70 more cuts, or a total of 2448 square inches—a blade cost of only 1/3 mill per square inch.

Here's proof that BLU-MOL Molybdenum Blades give the lowest cost per cut of any hack saw blade on the market. If you're not using BLU-MOL Blades it will pay you to investigate. For a test on your own work 'phone BLU-MOL distributor or write to us.

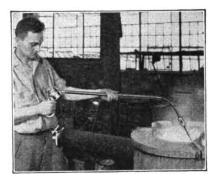
MILLERS FALLS COMPANY

Greenfield, Massachusetts



Tamms Pyramid Pyrometer

A pyrometer especially designed for the accurate calibration of molten metals has been brought out by Tamms Silica



Tamms Pyramid Pyrometer

Company, 228 N. LaSalle St., Chicago, Ill. The pyrometer works on the thermoelectric principle. Convenience of adjustment is the outstanding feature, perfect calibration being maintained constantly through a thumb screw adjust-

ment on the face of the dial. Another feature is the flexible end, which is adjustable to 180 deg. with perfect calibration assured. This feature minimises the possibility of dirt deposits which hamper accurate readings. All electrical parts and connections have been closed for positive protection and is parts are interchangeable for economic of maintenance.

The pistol grip handle provides ease of handling and both the hand and indicating dial are arranged at an angle that quick, accurate reading are possible without eyestrain cramped posture. As a further coarsilence, the base of the handle provide a good-sized hole suitable for handle instrument in a safe place and in use. The Pyramid Pyrometer light in weight and easy to operate.

Gray No. 4A Turret Head Metal Cutter

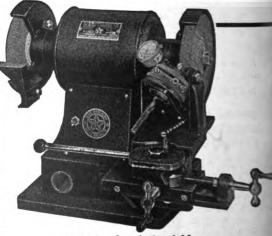
The line of metal cutters and nibble machines made by the Gray Machine Company, Philadelphia, Pa., has been augmented by the addition of the No. 4A Turret Head Metal Cutter illustrated herewith. This machine has a 24-in-

Grinds

81 SIZES OF

No. 31 to 1/2"

This Star Precision Grinder puts drill grinding on a production basis. Its simplicity and accuracy saves as high as 50% on drill costs and insures uniform accuracy that guarantees perfect holes and increases production.



Write for descriptive folder.

STAR MACHINE & ENGINEERING CORP.

Division of Star Electric Motor Co.

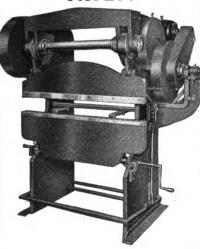
BLOOMFIELD AVE.

BLOOMFIELD, NEW JERSEY



CHICAGO STEEL PRESS

No. 253



Does 40% to 60% of the forming work turned out by the average shop.

Here's a profitable, economical brake ideally adapted for rapidly forming metal sections such as in stoves, refrigerators, soda fountains, steel cabinets, metal furniture, steel boxes, and a great variety of sheet metal specialties. Its variable speed drive operates from 17 to 50 strokes per minute. The No. 253 CHICAGO STEEL PRESS is accurate, compact, and ruggedly constructed of highest quality materials.

Sizes 4, 5 and 6 ft. capacities, up to 10 gauge.

Write for Circular No. 253

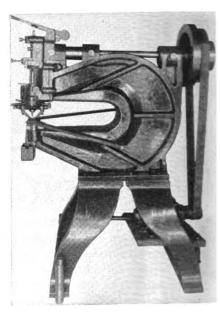
DREIS & KRUMP MFG. COMPANY

7418 LOOMIS BLVD.

CHICAGO

ILLINOIS

throat and capacity of % in. As shown, the machine is equipped with table support arms for supporting stock in any position, and leaning against the front leg of the machine is shown an interchangeable eccentric. The eccentric is said to be very important for a machine of this type as it broadens the possibilities for handling large work. The



Gray No. 4A Turret Head Metal Cutter

eccentric can be changed to accommodate shearing attachments for shearing stock up to and including 1/2 in. in thickness as it is often desirable to shear stock instead of nibble.

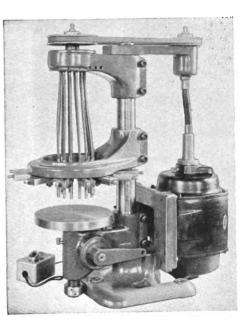
In other respects the machine is practically identical with the other sizes of Gray Turret Head Metal cutters made by this firm.

National Centrifugal Oil Extractor

The Leon J. Barrett Company, Worcester, Mass., has added to its line the "National" Extractor shown in the illustration. This extractor operates upon the centrifugal principle, oil being impelled by centrifugal force from the saturated chips which are held securely in the container. Only the finest particles

Adjustable Spindle Drill Press made with S. S. WHITE FLEXIBLE SHAFTS

- In this compact drill press, made by the Automatic Machine Company of Bridgeport, Conn., the use of S. S. WHITE Power Drive Flexible Shafts, provides an effective adjustable spindle arrangement that makes possible the setting of drills for any number of different hole combinations.
- a large diameter S. S. WHITE shaft also serves to transmit power from the motor to the countershaft.
- In addition to the advantage of flexibility, S. S. WHITE Flexible Shafts are fully capable of standing up in hard, continuous service, typified by a drill press, because they are not just coils of wire, but real shafts, soundly engineered and built to perform the duty for which they are intended.



ENGINEERING COOPERATION

We will be glad to help you work out any specific power drive or remote control problem . . . no obligation . . . just send us the details.

The S. S. WHITE Dental Mfg. Co. INDUSTRIAL DIVISION

10 EAST 40th ST., ROOM 2310S, NEW YORK, N. Y.



National Centrifugal Oil Extractor

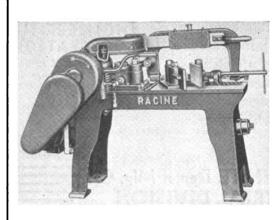
may strain through between the pan top and the closely fitting cover. Further treatment of the oil is seldom considered necessary, but should precipitation of sediment or sterilization be required, the firm mentioned also is prepared to furnish sterilizers, filters, pumps and tanks. The machine is said to recover 98%

per cent of all removable oil from chin in a three-minute run, leaving the chi The work pan is of one-pas pressed steel, and is practically ind structible. The base, column, curb and drum are cast of semi-steel, of heavy cross section. The alloy steel spindle is vertically mounted in ball bearings in a heavily cast gear box with a ball base that oscillates slightly in a base socket. Radial balancing springs compensate for gyration, yielding at critical speeds due to uneven load. Spiral gears, accurately ground to eliminate noise and totally enclosed in an oil bath, are driven by a self-adjusting right angle shaft, universal in action to motor or pulley. No belts pass under the machine. Forced lubrication is used. All parts are standardized for interchangeability. Plain or safety lids are furnished in accordance with all state requirements, and all safety features are available. Hoists of safety features are available. any type are supplied.

The extractor is made in seven different sizes with pans ranging from 15 to 30 in. in diameter and from 4% to 14 in. in depth. The height of the machine above the floor ranges from 35 to 45 in. and the amount of floor space ranges from 30x50 to 44x78 in. Shipping weight, approximately, 1185 to 3400

pounds.

RAGINE



ANNOUNCES

The NEW RACINE Utility Saw

6"x6" Capecity

Simplified Hydraulic Feed—Modera
Design. Engineered and built by
pioneers in the field. RACINE
Dealers everywhere will gladly tell
you about this remarkable, new,
low priced machine.

Write for catalogue.

"Standard the World Over"

RACINE
TOOL & MACHINE CO.
1770 State St. Racine, Wisconsin



"Curtain of Light"

The simplicity and effectiveness of the photoelectric cell have given it a versatility practically unequaled by any other mechanism for the operation of mechanisms of all kinds. The latest application of the phototube is in the interest of safety, comprising a control which



"Curtain of Light" Installation on a Sheridan Embossing Press

prevents the operation of a stamping press when the beam of light from the cell is intercepted by any part of the operator's anatomy. In presses that open from 12 to 1 in., however, a single beam of light cannot be depended upon to offer the desired protection because the operator might avoid intercepting a single beam when inserting or removing stock. To insure the effectiveness of the

application, a series of phototube cells are employed resulting in a continuous curtain of light which is as high, if not higher, than the maximum opening of the press. This application, known as the "Curtain of Light," is a development of the Electronic Control Corp., 2830 E. Grand Blvd., Detroit, Michigan.

As can be seen from the illustration,

the equipment consists of a specially designed light-source comprising a series of phototubes, a system of mirrors, the phototube housing, and the phototube amplifier. The light source is housed in a rugged container with the lenses and lamps built as a unit so that uniform alignment of the curtain of light is maintained even though the exterior housing might be slightly damaged by carelessness. The light source uses standard 50 or 32 candlepower volt automobile 6-8 headlight bulbs, operating from self-contained transformer supplying slightly less than 5 volts to each lamp. The phototube housing is unique in design, the condensing lenses being arranged so that every section of the curtain of light actually impinges on the cathode of one of the phototubes. This design eliminates dead spots which could be intercept-

ed and yet not actually cut off light from the cathodes of the phototubes. Although the curtain of light is 13 in. in height and approximately 2 in. in thickness, the amount of light cut off by an ordinary lead pencil inserted at 90 deg. to the axis of the beam of light causes sufficient fall off in light intensity to drop out the relay and stop the press within % in. of die movement. To insure fool-proof operation of the



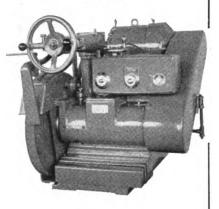




STERLING ADRASIVES

The **BOWGAGE**

INDEPENDENT
GRINDING WHEEL
HEAD



A self-contained unit hydraulically operated with an automatic grinding cycle—with DIMINISHING FEED. Can be applied to most any plain grinder.

Weight 1900 lbs. Takes wheels 24"x2"x12" — 20"x 4"x12".

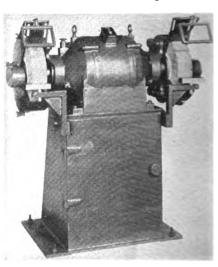
FITCHBURG GRINDING MACHINE CORP.

Fitchburg, Mass.

safety device, the control equipment was designed so that in the event of power fallure, tube fatigue, or a burned-out light source lamp, a weighted arm disengages the clutch and applies the brake so that the press will stop within ½ in movement of the dies. The "Curtain of Light" when installed on a press of the type shown in the illustration not only insures safety to the operator but also increases production due to the fact that the press is completely controlled by the curtain of light. As the operator steps back and withdraws his arms from the curtain of light area, the press automatically starts and proceeds through its cycle.

"Production" Type 268 14x3-In. Grinder

The Production Equipment Company, 5219 Chester Ave., Cleveland, Ohio, announces several recent changes in the

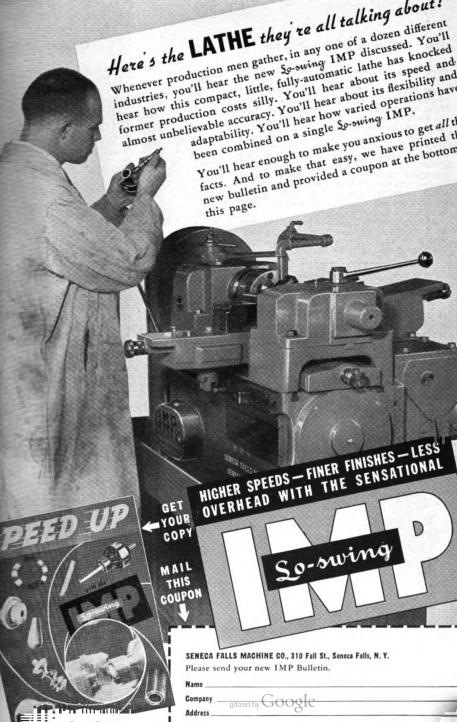


"Production" Type 268 5 H.P. 14x3-In. Grinder

design of their Type 268 Grinder. This machine, which is built for heavy duty applications in ratings from 3 to 15 h.p., has been redesigned to provide a number of new features.

The wheel guards, which are of welded steel construction conforming to the Safety Code requirements, have been made adjustable to wheel wear and can be rotated as to position of grinding. Adjustable safety glass eye shields have

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206

been mounted on the guards.

The tool rests are now located on the base and are adjustable by slide and clamp attached to the sides of the base. This construction provides rigidity with all strains absorbed directly by the heavy base. A hinged door of unusual width is located on the front of the base to give ample room for inspection or repair of the magnetic starter, which is located inside the base. The push button is mounted on top of the motor where it is convenient for the operator. A heavy shaft locking device has been added which securely clamps the spindle while wheels are being changed.

wheels are being changed.

Any or all of these features can now be furnished on the Type 268 Grinder, which is built for wheel sizes ranging

from 12x2 in. to 24x3 inches.

Lyon Cantilever-Type Hydraulic Lift Truck with 10-In. Elevation

The lift truck shown in the illustration, an adaptation of the standard Lyon Hydraulic Lift Truck made by Lyon Iron Works, Greene, N. Y., was designed for a special handling problem where 10-in. elevation was necessary instead of the usual standard 3-in. elevation. The



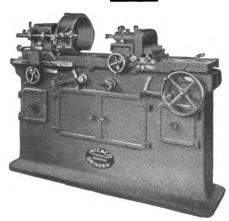
Lyon Cantilever-Type Hydraulic Lift Truck with 10-In. Elevation

10-in. elevation is obtained with the cantilever-type elevating frame.

The hydraulic elevating feature provides exceptionally easy lift, easy control and easy handling. The truck shown is rated at 3500 lbs. capacity. The lowered height is 9 in. and the elevated height is 19 in. The carrying

WICACO

Puts You Way Behind the Decimal Point



5 Precision Features

Positive Stop for Blind Hole Grinding Underslung Drive Water-Cooled Wheel-Head

Instantaneous Reverse Rigid Work-Head

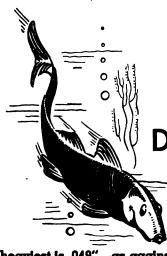
The New WICACO Precision To

Grinder puts you WAY behind the decimal point when it comes to close tolerances.

The WICACO is the last word in accuracy. It will pay you to investigate this machine. Write for complete facts.

THE WICACO MACHINE CORP.

WAYNE JUNCTION PHILADELPHIA, PA-



SMALL DISPLACEMENT

Thin fish cut along with but little displacement of water.

Napier Blades, too, cut with but little displacement. The kerf of the

heaviest is .049"—as against .25", or more, of a circular saw. The saving is amazing.

In cutting a steel bar 20"x6" into $\frac{1}{2}$ " discs. for example, the Napier Band Saw gets 9 more discs than does a circular saw. Metal wasted is money lost. Save metal and money with a Napier.

Write for illustrated broadside giving complete data on the ten money-saving features of the HORIZONTAL NAPIER BAND SAW MACHINE.

METAL SAW & MACHINE CO.

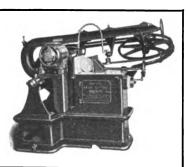
40 NAPIER STREET

SPRINGFIELD, MASS.

TEN OUTSTANDING FEATURES

- 1. Accuracy
- 2. Speed
- 3. Small Displace-
- 4. Prolonged C u tting Power
- 5. One Horsepower
- 6. Handles both Large and Smell

- Work
- 7. No Time Out
- 8. Low Installation
 Cost
- 9. Low Depreciation Cost.
- 10. Skilled Handling Unnecessary



platform is 24 in. wide by 42 in. long. The illustration shows the truck elevated to the full height of 19 inches.

Williams "Vulcan Supertong"

A chain pipe tong drop-forged from alloy and high-tensile steel and heat treated, which is to be known as the "Vulcan Supertong," has been placed



Williams "Vulcan Supertong"

on the market by J. H. Williams & Co., 75 Spring St., New York, N. Y. The design and structural features of "Vulcan Supertongs" are identical with those "Vulcan" Tongs; however, of Williams the manufacturer states that "Vulcan Supertongs" have at least 50 per cent greater strength than regular Vulcan Tongs of corresponding size, without any increase in size or weight.

"Vulcan Supertongs" are equipped with Williams new "Superchains", which are made from alloy steel, heat treated and cadmium plated. "Vulcan Supertongs" are made in eight sizes for pipe from 1/8 to 18 in. The tongs are finished in gray enamel and the jaws have a blue panel with bright faced edges.

Nicholson Style J Control Valve

Recent addition to the company's several lines of control valves for all pressures and mediums is the model illustrated, designated Style J, a low-priced, non-leaking valve in three and four way types, for operating single and doubleacting cylinders utilizing air or oil on pressures to 125 lbs., a product of W. H. Nicholson

Co., 229 Oregon Street. Wilkes Barre,

The valve is made in $\frac{1}{4}$ in., $\frac{3}{8}$ in., $\frac{1}{2}$ in. and $\frac{3}{4}$ in. sizes, of flat disc, protected seat design, bodies and seats of semi-steel, discs of bronze. Port areas are equivalent to full

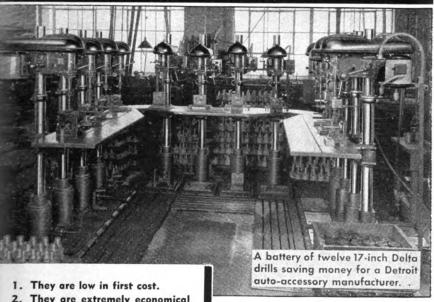


Nicholson Style Control Valve

area of pipe sizes they accommodate, and port design permits throttling or full



4 Big Reasons for Using DELTA DRILL PRESSES



2. They are extremely economical to maintain and operate.

3. They are highly adaptable, and engineered for long life.

 They will continue to save you money throughout their entire life.

Because Delta drills are built to precision standards in a modern production plant, they cost you less than any comparable drills you can buy.

Because they are equipped with selfsealed ball bearings throughout, they require no lubrication at any time and practically no other maintenance.

Because they are thoroughly engineered

"stand up and take it" alongside drills costing several times more.

Because of their low cost, low maintenance and low power consumption, they can be used in dozens of places in your plant where heavy, expensive machines would be out of the question.

Let us tell you the complete story of Delta Drill Presses, 11", 14" and 17" models. Write—NOW—for complete information and name of nearest dealer. It will pay you dividends.

DELTA MFG. CO.

609 E. VIENNA AVE.

opening, as required. All pipes are 90 degrees apart and lead from valve base horizontally. Valves can be dis-assembled for inspection without breaking pipe connections. Operating levers require 90 degrees travel for complete cycle and may be easily adjusted radially on valve stem to suit convenience of operator.

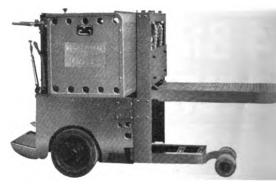
210

Wright Hibbard Industrial Truck

A new electric high lift atform truck has just just platform

been recently developed by the Wright Hibbard Industrial Electric Truck Company, Phelps, N. Y. The truck has been designed with the ultimate feature of compactness in overall dimensions. The overall length of the truck with a 42-in. long loading platform is 89 in. and the overall width is 28½ in. with the average size of battery required.

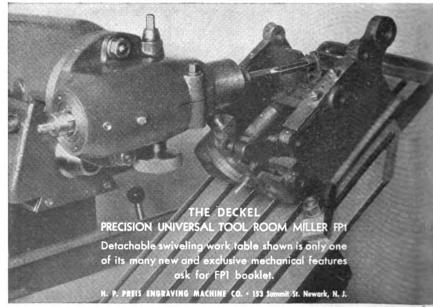
Another desirable feature is the type of lift used, which involves the use of a pair of steel roller chains, insuring max-



Wright Hibbard Industrial Electric Truck

imum efficiency in power consumption and long life of the lifting mechanism This truck, with loading platform of 18 in. to 28 in. wide and from 3 in, to 53 in. in length and from 61/2 in high to 11 in. in low position, has a maximum lift of 72 in. from the floor.

Full details are described in Folde No. 5, which may be had by addressin the company at the above address.





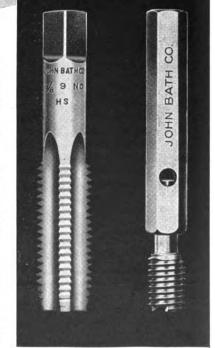
You get maximum accuracy from BATH Taps—from BATH Thread Gages too. Why not guarantee accurate results by using them together? In this way you check accurate tapping with an accurate gage—you can't miss.

BATH Taps and Thread Gages are ground from the solid after hardening. Thus, the teeth edges have the same perfect grain structure as the heart of the tool. They're tough all the way through.

OHN BATH & CO.

ORCESTER.

MASS.







And This RIPOID Thin Tool-Steel

Blade Wheel Is the Reason

If you want a new experience that will show you how quickly, easily and cleanly pipe can be cut, try a REPORT Cutter.

You'll find the patented PALIDID Cutter wheel a real improvement. Coined out of tool steel sheet, hammered, heattreated and cast into a steel-bearing hub, it rolls smartly through any pipe, practically without burr—many more cuts per wheel.

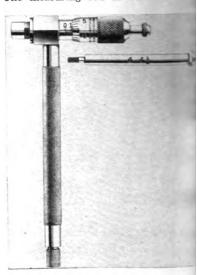
Try one at your Jobber's

THE RIDGE TOOL CO. ELYRIA, OHIO



Brown & Sharpe Telescopin Micrometer No. 26

A telescoping inside micro which the diameter of a decreess can be measured has on the market by Brown & Co., Providence, R. I. To conly necessary to insert the minto the hole; the telescoping apoint adjusts itself to the The measuring rod is then loca



Brown & Sharpe Telescoping Insid Micrometer No. 268

turning the knob at the end of handle, after which the tool can withdrawn. The micrometer thimbithen revolved until it contacts shoulder of the measuring rod and measurement can be read in thousand directly from the micrometer. thimble is graduated in thousandth an inch and a range of from 2 to 6 is available. Provision is made for justment of wear of the measurpoints.

Challenge Semi-Steel Layout Surface Plate

A new, improved Layout Surface P for accurate layout and inspection is now being manufactured by The lenge Machinery Co., Grand Haven.



Solve your small hole honing roblems with this new equipment

It requires less than one minute to it up and locate a part on the Sunnen recision Honing Machine. A round ble is generated with a single cuting stone which is expanded to the ill length of bore before any cutting ction takes place. The two solid guide toes of mandrel the same length of one prevent any misalignment.

xpansion of stone and cutting presure is controlled with a foot lever with a micrometer dial stop to adjust diameter size.

Various grades of stones can be furnished for any metal except babbitt and will hone in any diameter hole from .365" to 2.400". Accuracy within .0001" guaranteed for straightness and roundness.

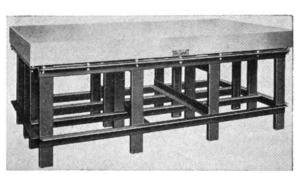
SUNNEN PRODUCTS CO. 7903 Manchoster St. Louis, Mo.

IF YOU HAVE A HONING PROBLEM send for a copy of our Honing Analysis Blank. Use it to give us full information and we will tell you whether or not this equipment is suitable and just what it will do for you.

SIINNFN PRECISION

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214



Challenge Semi-Steel Layout Surface Plate

Challenge Semi-Steel Layout Surface Plates are especially designed for use in industrial plants that require a true, rigid, smooth surface for assembly, layout, and inspection of products in process.

The semi-steel plate is planer finished, smooth, square, and heavily ribbed underneath to prevent sagging. It comes in standard sizes of 12x18 in. to 49x99 in. Special sizes can be made to order. The all-steel arc-welded frame is provided with 32 lock leveling screws.

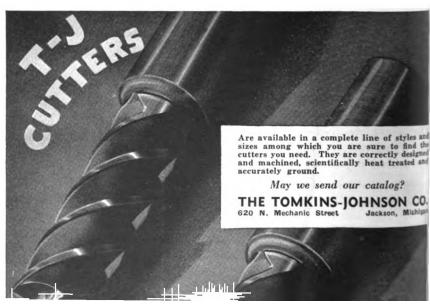
Plates may be purchased with or without the steel supporting frame. Further information and prices are available on request to the manufacturer.

Jackson Model B4 Electrode Holder

Users of arc welding equipment have long sensed the need for a electrode holder that or light work would combine light weight with maximum conductivity a holder that would by

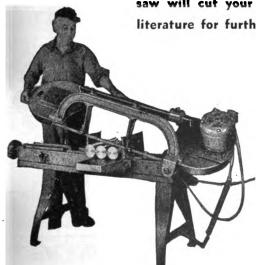
easy to handle and small enough to b successfully manipulated in tight place

successfully manipulated in tight places. These qualities are claimed for a net type of holder just introduced by the Jackson Electrode Holder Company, 653 Woodward Ave., Detroit, Michigan. The new model—B-4—weighs 15 oz., has current capacity of 200 amps., handle rods 1/16-in. to 3/16-in. diameter and is made entirely of Mallory 3 Metal This alloy insures strength and at the same time has 85 per cent of the conductivity of pure copper.



ACURACY

For quantity production the WELLS METAL CUTTING BAND SAW can't be beat! Precision manufacturing methods, rigid ball bearing saw guides, a sturdy vise and perfect blade control guarantee accuracy. In maintenance and tool room work these versatile saws are invaluable. Bars, angles, tubes and sheets of almost any metal can be cut with unusual speed. A Wells saw will cut your production costs. Send for literature for further proof.



Built in two sizes:

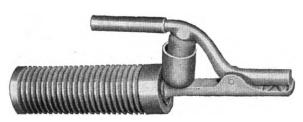
No. 5 SIZE 5" diameter round or 5"x10" flat.

No. 8 SIZE 8" diameter round or 8"x16" flat.

WELLS MFG. CORP.

THREE RIVERS, MICH.

The handle insulation is thoroughly ventilated. Upper tong and compression



Jackson Model B-4 Electrode Holder

spring are amply protected by fiber insulation.

M & W Dielectric Enamel

A black enamel with special dielectric properties has been developed by Maas & Waldstein Company, Newark, N. J. This dielectric enamel is said to be especially suitable for finishing electrical apparatus, such as steel switchboards and instrument panels, coils, and radio bases. It dries to a rubber finish, and is tough, durable, and has high

electrical resistance, according to the manufacturer. The enamel is applied

by spraying, and a switch board panel that has been marred or defaced can easily be refinished without dismantling by spraying on another coat of the enamel.

A surfacer, with similar dielectric properties, is also supplied for preparing the surface to be finished with the enamel.

Doall Deep-Throat Type MD Metalmaster

A new Doall three-in-one contour machine with 30-in throat capacity has been placed on the market by Continental Machine Specialties, Inc., 1301 S. Washington Ave., Minneapolis, Minn. This machine is designated as the Metalmaster Deep-Throat Type "MD". Like its companion model "M", a feature of this new designed type of machine is a built-in automatic instant butt-welder for the saws.

The new welding unit is an ingenious, compact device having features not found in the single-purpose saw butt-

IT'S A PRODUCTION MACHINE

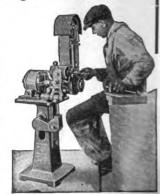
Type S Production Polishing Machine

4 machines in one!

A Centerless Feed Polishing Machine
—a Vertical or Horizontal Belt Grinder
—a Surfacer or Polisher—an Internal
Grinder or Polisher.

It's the machine for your cylindrical polishing and straight line finishing on flat work.

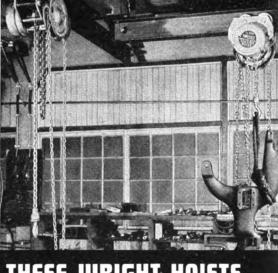
Write for complete information.



PRODUCTION MACHINE CO., Greenfield, Mass.

21 FEATURES MAKE IT RIGHT!





THESE WRIGHT HOISTS ARE *Right* FOR THIS JOB!

These Wright Army Type Trolley Hoists are just right for the hoisting service required for machine tool assembly. . . . Designed for use where headroom is

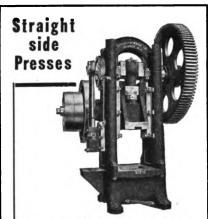
scant. Timken Roller Bearing trolley permits movement along the I-beam with little effort. Zinc coated finish defies corrosion. Ball bearings in the load wheel bearing permit exceptionally easy lifting. Safety load chain guard, special analysis, electrically welded hand chain and drop-forged hook insure absolute safety. . . . This Wright hoist is right in every one of its twenty-one features. Send for the new catalog which gives you all the facts.



WRIGHT MANUFACTURING DIVISION AMERICAN CHAIN & CABLE COMPANY, INC. YORK, PENNSYLVANIA

In Business for your Safety

WRIGHT Junproved Speed HOISTS



Outstanding in every detail for heavy blanking and forming work. All stresses are taken centrally.

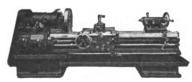
Write for new catalog illustrating and describing this and other presses.

Zeh & Hahnemann Co.

184 Vanderpool St.

Newark, N. J.

Real Production with G-K Single Lever Control Lathes



e With fewer handles or levers to operate, G-K Single Lever Control Lathes make it possible to turn out work more quickly and with greater case.

This and other outstanding features about which we shall send information make G-K Lathes ideal for the efficient shop. Write for catalog.

GREAVES-KLUSMAN TOOL CO. OINOINNATI, OHIO

welding machines as used by band saw manufacturers. Narrow-blade saw welding requires a precision welding instrument in order to get the exact amount of current for each width of saw. This is accomplished with a voltage regulator; thus every weld is made exactly uniform. The entire butt-welding operation is done automatically by merely pressing one lever. The weld is completed instantly, and the joint is stronger than the rest of the saw.

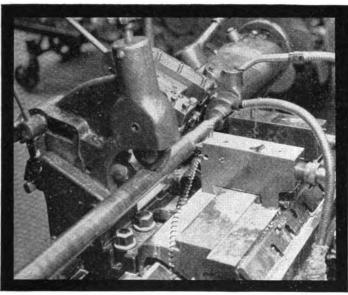
Another feature of this model is dial



Doall Deep-Throat Type MD Metalmaster

control of cutting speeds. A speed indicator records the exact speed within the broad range from 40 to 800 feet per minute. A "job selector" dial translates the correct speed to use in sawing or filing 48 different materials. An apprentice or new operator can produce exacting results with little or no training in contour machining, because of this simple control system and the automatic welding device.

This model has a new power work feed actuated by weights and levers. The



Turning front propeller shaft 45 5/16' long, diameter 1.490°. Material: S.A.E. 3140, heat treated to Brinnell hardness of 302 to 340. Operations: turn 5' on outer diameter and chamfer 60° on turned end. Comparative performance of V-R Grade E and H.S.S. tools:

Tools Used	Depth of Cut	Feed	Speed	Pieces per Grind
V-R Grade E	.109"	.015"	123 Ft./M	600 to 800
H.S.S.	.109"	.010"	35 Ft./M	3 to 10

Again the superiority of Vascoloy-Ramet, the tantalum carbide tool material, is translated in terms of time and dollars saved. An amazing increase in pieces per grind, faster time from floor to floor, lowered production costs!

Produced in 17 standard grades of different tantalum carbide content, strength and hardness, V-R alone covers the entire range of machinable materials and machining needs.

Unrivalled in the machining of all steels, it stands alone as the

only material capable of turning steel without "cratering." It excels in performance on cast iron, semisteel and non-ferrous materials.

Its revolutionary performance and economies have already established V-R as the preferred tool material in small shops, and in the country's great industrial plants as well.

Write for the new V-R catalogprice list, sent upon request.

VANADIUM-ALLOYS STEEL CO.

VASCOLOY-RAMET DIVISION NORTH CHICAGO, ILL.

TANTALUM CARBIDE TOOL MATERIAL...



A GRADE FOR EVERY USE

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VASCOLOY-RAMET **BLANKS**

Vascoloy-Rame is available i three forms, (s completely fin ished tools, (b milled and braze tools, an blanks. and (e blanks are fur nished in 5 stand ard styles and i sixes to mee every require ment. To mak tools with V-l blanks is a simpl operation, full described in a nev instruction book let, available fre -upon request

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weight or pull is adjustable with a hand wheel located conveniently for the op-Another feature of the power feed is a mechanical toggle which permits mechanically rotating the work to follow a contour, instead of guiding the contour by hand. A foot pedal permits instant release of the work feed.

The work table has four-way tilt, and

a new type of detachable disc cutting unit is furnished. Work thickness capacity is 8 in., although this model, as well as the smaller Metalmaster, is made on special order to cut up to 12 in.

thickness capacity.

Another feature is the use of arc welded steel construction in the entire base of this machine in place of cast-This welded housing is seasoned before machining. This construction carries out the clean styled appearance of the Doall and gives other well known advantages of welded construction.

"Production" Type 322W Buffer

To meet the requirements of heavy duty buffing with unusual distance between (in a "motor-in-head" Wheels type of machine), The Production Equip-ment Company, 5219 Chester Ave., Cleve-land, Ohio, announces the Type 322W Buffer shown in the illustration.

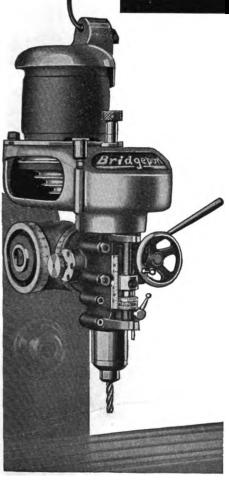


"Production" Type 322W 10 H.P. 3600 R.P.M Four-Bearing Buffer

machine, which is of a heavy construction, is designed with four bearings and furnished with a spindle of very liberal size. The diameter of the spindle extension adjacent to the outside bearings is 1 13/16 in. The spindle housing sleeves are designed to allow ready assembly and disassembly.

The machines are built in ratings from 4 to 15 h.p., and are furnished with





THE BRIDGEPORT MASTER

HIGH-SPEED Milling, Drilling and Boring

On End Mills. Hours of Labor. Temper of Mechanics working with old Special fixtures, Angle Plates and Vises

After seven years of continuous service The Bridgeport Attachments are still giving the same matchless porformance. One company alone has forty-five of these machines in use in their die sinking departments.

A number of concerns use from ten to fifteen machines each for tool and die as well as production work.

We doubt if we can overstate the value

of the Master Attachment for the small tool shop where a unit of this type will solve most of the awkward time eating jobs.

LET US tell you where a Bridgeport High Speed Milling Attachment may be seen in operation. Your time in viewing this equipment will be well spont.

Write for Illustrated Bulletin.

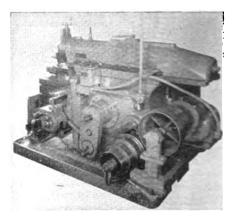
EPORT PATTERN & MODEL WORKS BRIDGEPORT, CONN.

enclosed motor, flanges, nuts, safetytype spindle threads, and magnetic starter. The distance between wheels is approximately 4 in., varying slightly according to the rating of the machine.

When built in two-bearing construction, this general design is designated as Type 322. The two-bearing machine is furnished with open spindle extension and has a distance between wheels of approximately 3 in. Both designs can be supplied in any desired motor speed, but ordinarily are built for either 1800 or 3600 r.p.m.

"Production" 5 H.P., 250 R.P.M. Shaper Drive

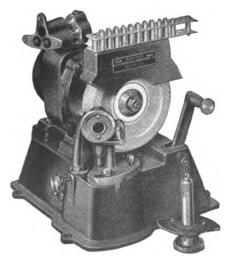
The Shaper Drive built by The Production Equipment Company, 5213 Chester Ave., Cleveland, Ohio, has been built to conform to requirements for heavy duty, and compact intallation. The general construction is similar to that used on their Type 844 drive, which is applied on lathes, screw machines, millers, and other machines which allow the supporting column to be attached to the side or the rear of the machine tool. The drive itself consists of a geared



Production 5 H.P. 250 R.P.M. Type 844 Shaper Drive Attached to 26-In. Kelley Shaper

motor with extended shaft and outboard bearing, all mounted on a rigid base. All bearings are of anti-friction type, and the gears operate in oil. The countershaft cone pulley is mounted on the extended shaft and the drive attached to

"BLACK DIAMOND" DRILL GRINDER





You save time and money with a "Black Diamond" Drill Grinder—ne complicated adjustments—an exclusive feature.

The money you save on proper "Black Diamond" Drill Grinding will quickly pay for the cost of the machine.

You'll want to know more about this time and money saver. Write for Bulletin No. 115.

BLACK DIAMOND

SAW & MACHINE WORKS, INC. 45 North Ave. Natick, Mass.

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the lower rear of the shaper frame by

means of special castings.

The mounting uses rigid arms at each end of the drive base and has separate arms which hold the cam release shaft, and which also provide adjustment for belt stretch. Two release cams are used, one at each end of the base so as to maintain accurate alignment of the drive under all operating conditions. These cams are provided to allow for either proper belt tension during operation, or for releasing the belt to permit shifting on the cone steps. The cams give a throw of practically 360 deg. and the cam lever is arranged on a semiratchet principle to allow partial throws when desired.

These pivoted drives permit the use of close pulley centers with positive power transmission to the full capacity

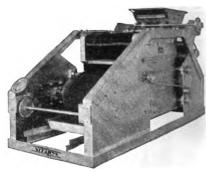
of the machine.

Pat'd. and Pat's. Pending

Heavy duty drum starters are furnished as standard equipment. These are arranged with spring return for reversing the motor during set-ups, and with a fixed position for operating the motor can be plugged in either direction for quick stopping, and materially reduces the time required for either set-ups or adjustments.

Improvements in Stearns Type Q Magnetic Separator

The Stearns Magnetic Mfg. Co., Milwaukee, Wisconsin, has made some rad-



Improvements in Stearns Type Q Magnetic Separator

ical changes in the design of its popular Type "Q" magnetic separator. This unit has been perfected primarily for the separation of free iron from finely ground

They take hold

UNSHAKO

The Nut that can't shake loose

and wont let go-

'til you "tell' them with a wrench

Once the "Unshako" has been fully tightened, the locking ring positively prevents its backing eff.

It supplies a live, counteracting force within the nut that defeats vibration's efforts to shake it loose as effectively as could a giant hand's constant grip.

loose as effectively as could a giant hand's constant grip.

Yet . . . an ordinary wrench, applied without under

effort, will back-off the "Unshako" as smoothly as

you please.

Every "Unshako" Self-Locking Nut is a self-centained unit . . . no extra washers, plus or other gadgets to bother with.

Send for literature.

STANDARD PRESSED STEEL CO.
BRANCHES JENKINTOWN, PENNA. PRANCHES

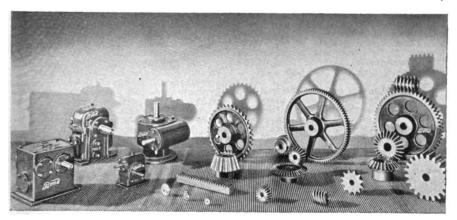
Cutout BOSTON section showing DETRO

DETROIT

BOX 556

ST. LOUIS SAN FRANCISCO

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ACCURATE • UNIFORM

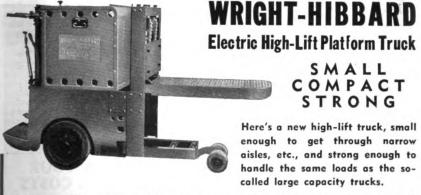
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material by an inductively magnetized vibrating screen. It provides an efficient separation of unusually large capacity for material where there is very small percent of free iron and large amount of non-magnetic material without an appreciable loss of the non-magnetic material.

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This new Type "Q" is furnished for either pulley, or motor drive and designed for DC current. Where necessary generator sets can be provided. The capacity of the particular machine illustrated is approximately 4000 lbs. per hour of material 200 mesh, weighing 100 lbs. per cubic foot.

Fellows Enveloping Gear Generator

A machine for finishing gear teeth by a method known as the enveloping generating process, shown in Fig. 1, has re-cently been announced by the Fellows Gear Shaper Company, Springfield, Vermont. The principle employed in re-moving metal by this process differs from conventional gear cutting methods: (1) the tool and work are rotated together without control by any indexing mechanism; (2) cutting is accomplished by setting axes of tool and work askew to each other and by bringing the tool into intimate contact with the work under pressure; (3) the tool is rotated at high speed and traversed at slow speed. first in one direction to finish one side of the teeth, then reversed, and rotated and traversed in the opposite direction to finish the other side of the teeth. When tool reciprocation is not restricted the tool is traversed for a distance slightly greater than the gear face width, and one complete cycle finishes the gear.

In cases where full face width reciprocation is restricted by a shoulder, the work is fed steadily upward into the tool, the latter being reciprocated about 1/32 inch, to enhance the cutting action and improve the finish. This upward feeding action continues for a predetermined time, the tool making one or



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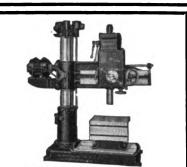
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Tools used on the No. 8 Enveloping Gear Generator are made in a variety of types depending upon the character and shape of the work and other conditions. The two-piece type of tool shown at the top in Fig. 2 for finishing spur and helical gears, can be used where there is no interfering projection on the work.

Two other types of tools are shown

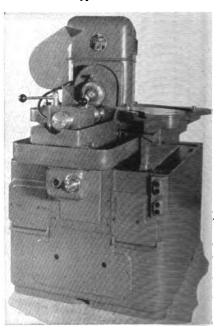


Fig. 1.—No. 8 Enveloping Gear Generator for finishing spur and helical external and internal gears.

in Fig. 3. The one at left is known as the one-piece "slotted" type. This tool is made with deep angular slots cut to the full depth of the teeth and on a helix, thus producing a multiple number of cutting edges. It is very free cutting and is especially adapted to the cutting of shoulder gears. Because of its design, it is ideal for semi-finishing where the character of the work requires two finishing cuts. When used for final finishing, the tool is ground to envelop the work.

The tool at the right, Fig. 3 is of



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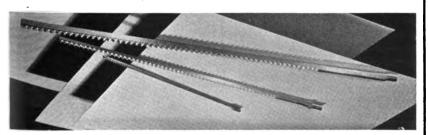
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the "serrated" tooth type. A series of shallow grooves are cut on both sides of the teeth, thus presenting a multiplicity of cutting edges to the work. This tool is particularly suited to final finishing. All three types of tools shown in Figs. 2 and 3 are made to envelop the work when conditions warrant.

The machine is automatically lubricated and is provided with sight-feed oilers. A reservoir in the slide lubricates the slide and gibs, and a reservoir in the knee performs a similar function for the knee and connecting members.

This machine is arranged for complete

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cuts mouldings, tubes, strips of metal and compositions... and accurate to .005 inch.

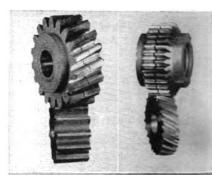


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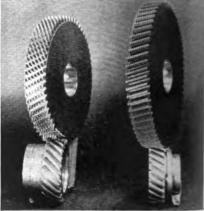
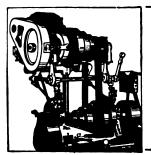


Fig. 2.—(Above)—Two-piece type of Enveloping Generating Tools used for finishing spand and helical gears. Fig. 3.—(Below)—One-piec Enveloping Generating Tools of the "slotted and "serrated" tooth types.

electrical control. The main motor which is located in the base is 1 h.p.



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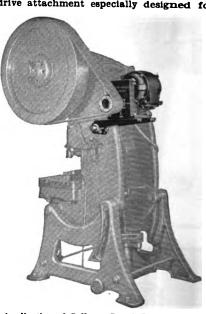
AC., constant-speed, 1800 r.p.m., totally enclosed, ball bearing; 220, 440 or 550 volts, 3 phase, 60 cycles. The motor that drives the tool spindle is 2 h.p., AC., constant-speed, 1200 r.p.m., totally enclosed, ball bearing, fan cooled; 220, 440 or 550 voits, 3 phase, 60 cycles.

The electrical control equipment comprises: main motor starter, tool-spindle motor reversing starter, six interlocking contactors, selector switch, two door interlocks, two electrical interlocks, push button station, "stop", "start", "jog-run", and terminal board. Control equipment is an integral part of the machine

and is enclosed by a hinged door. Maximum capacity is 6 in. pitch diameter. 21/2 in. face width, 4 diametral pitch.

Cullman Punch Press Drive

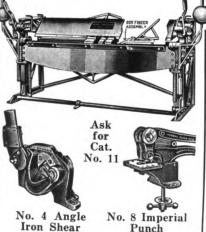
Cullman Wheel Co., 1336 Altgeld St., Chicago, Ill., has brought out a motor drive attachment especially designed for



Application of Cullman Punch Press Drive

use with punch presses. A standard type punch press to which a Cullman Punch Press Drive has been attached is illustrated herewith. The drive consists of the motor, a speed reducer, drive pulley, and the mounting brackets by which

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Whitney Metal Tool Co. FORBES ST. ROCKFORD, ILL.

EDGEMONT" SERVICE FRICTION CLUTCHES **EXPANDING "TYPE B"**



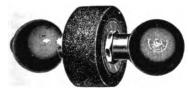
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it is attached to the column of the press.

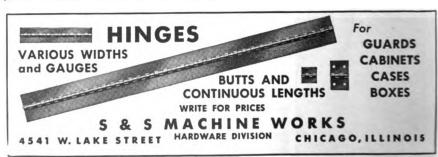
The punch press drive, as other Cullman drives, is an individual electric motor unit designed to eliminate countershafts and belting, making the machine entirely self-contained. The installation requires practically no alteration of the machine, four bolt holes being required to complete the usual installation. The sprocket shafts are supported by removable cast iron bearings revolving on cast iron in a bath of oil and are enclosed in an oil and dust-proof housing.

The flywheel speeds are determined by the sprocket ratio in the speed reducer and size of the driver pulley. The punch press drive is made in four sizes: 1/2 h.p., 1 h.p., 2 and 3 h.p., and 5 h.p. In addition to the advantages which are inherent in the individual drive, an advantage of this unit consists in the saving which can be made in the cost of 1800 r.p.m. motors over 600 or 900 r.p.m. motors. Also, by using the large driver pulleys, the belts will have more driving surface, which means greater efficiency.

Challenge Abrasive Cut-Off Machine

The Challenge Machinery Co., Grand Haven, Mich., has recently marketed a new Abrasive Cut-Off Machine that will cut any metal hard or soft, tubular or solid. It is said to cut hardened tool steel easily and quickly.

This Challenge Abrasive Cut-Off Machine is a self-contained utility unit in the moderate-price class. It has a capacity up to one inch thickness. The table is adjustable and measures 15x14 inches. Gauges are conveniently located and easily adjusted. The base is cast iron. The machine comes equipped with a 6x1/32x1/2-inch elastic cut-off wheel





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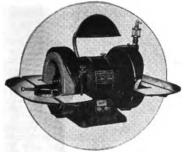
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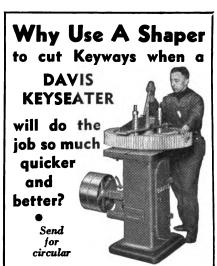
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Challenge Abrasive Cut-Off Machine

A.C. motor is included in the price of the machine.

Hunt Bronze Forged Pilot-Operated Hydraulic Valve

C. B. Hunt and Son's Company, Salem, Ohio, has brought out a new bronze-forged pilot-operated hydraulic valve, the design of which embodies the same no metal-to-metal wear principle and minimum of moving parts as characterizes this company's already well known line of "Quick-As-Wink" Air Control Valves.

The illustration shows bronze forged housing valve pilot operated, for 4-way operation. Also built for 2-way and 3-way. Made in ½ in., ¾ in., and 1 in. sizes, in two styles, for 1000 pounds working pressure and for 2000 pounds working pressure. The bronze forgings used as housings are among the largest bronze forgings ever made. The employment of the dropped forged bronze housing with its high physical strength affords an additional factor for long life with water or corrosive fluids.

In the "Quick-As-Wink" valving prin-

In the "Quick-As-Wink" valving principle, the valving operation is accomplished in the 2-way valves by only one moving part; in the 3-way and 4-way valves by coincident motion of the two valve bodies or plungers. The valve

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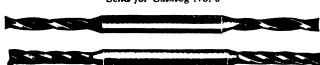
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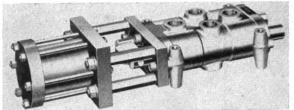
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Hunt Bronze Forged Pilot-Operated Hydraulic Valve

bodies or plungers are made of stainless steel. These are "free-floating" in special packings, avoiding metal-to-metal contact. Balanced port action in conjunction with the valving ring and the no metal-to-metal contact, is claimed to provide a combination for extremely long life and satisfactory performance in hard service. Short travel is an aid to easy operation.

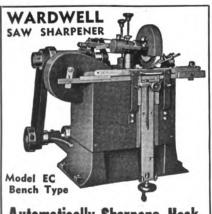
Accessibility is such the complete inspection, replacements of parts and reassembly can be made in a few minutes without disturbing the hydraulic piping. Connections are provided so that the piping may be permanently connected above or below housing. The only in-

ternal moving parts, the stainless steel valve bodies or plungers, in several years of hard. continuous service have shown imperceptible wear due to valve action, in millions of operations.

Sheldon 10-In. Lathes with Under Motor Drive

Sheldon 10-in. Lathes, product of Sheldon Machine Co., 3255 Cottage Grove Ave., Chicago, Ill., can now be furnished with an Under Motor Drive Attachment either in a cabinet leg. as illustrated, or the unit can be attached directly to the under side of a bench where a bench type lathe is wanted. The unit provides four speeds by means of two positive clutches on the drive shaft. These clutches are operated by the two levers shown in front of cabinet

There are eight spindle speeds, four direct and four thru backgears, and in making these speed changes it is only necessary to turn the clutch levers.



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Sheldon 10 in. Lathes swing 10¼ in. over the ways and are furnished in two bed lengths, giving 20 in. and 26 in. maximum center distance. The spindle runs in bronze bearings, has a 1 1/16 in. hole, and round collets up to ¾ in capacity can be used. All 10-in. lathes are furnished with semi-quick change gear boxes containing the necessary gears

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for cutting threads from 4 to 80 per inch. Either Plain or Worm Feed and Power Cross Feed Aprons can be furnished.

Reed-Prentice No. 5 Vertical Miller and Die Sinker

The No. 5 Vertical Miller and Die Sinker shown in the illustration has been placed on the market by Reed-Prentice Corporation, Worcester, Mass. This machine is equipped with a helical gear drive to the spindle and the entire top gear box of the machine is equipped with helical gears mounted on Timken bearings, replacing the previous belt drive construction.

The working surface of the table is 68x16 in., the distance between the three T-slots being 5 in. The throat depth is 20 in. and the distance from the center



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HIGH SPEED SCREW SLOTTING SAWS Circle "R" high speed screw slotting saws are made from the finest steels and are hardened and tempered correctly to give maximum service under the most severe usage. SPECIFY CIRCLE "R" SAWS.

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line of the spindle to the face of the column is 11½ in. Longitudinal power feed, 48 in.; cross power feed, 16 in. Rapid power traverse in either direction, 100 inches.

The vertical adjustment of the head on the column is 15 in. and the vertical feed of the spindle is 9 in. Maximum distance from end of spindle to table, 30 in. Eighteen spindle speeds are provided, the standard range being from 17 to 600 r.p.m. The high speed range is from 34 to 1200 r.p.m. Eight feeds are provided, the feed range for 18 speeds being from 0.002 to 0.297 inch.



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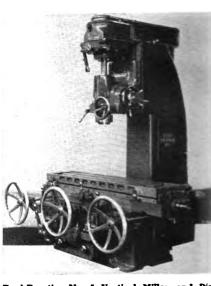
e U. S. Multiple Drill Head Units quickly convert any single spindle drill into a multiple unit. Thus, you are assured more holes per minute and larger profits.

Send blue prints for estimates.

The United States Drill Head Co.

1954 Riverside Drive CINCINNATI, OHIO

The hole through the spindle is 1 1/16 in. diameter and the taper hole is N.M.T.B.A. standard of 3½-in. taper per



Reed-Prentice No. 5 Vertical Miller and Die Sinker

foot with a No. 10 B & S adapter. The spindle sleeve is 6-in. diameter and 20-in. long. The height of the machine above floor is 33 in. and floor space required is 115x30 in. Shipping weight, 11,500 pounds.

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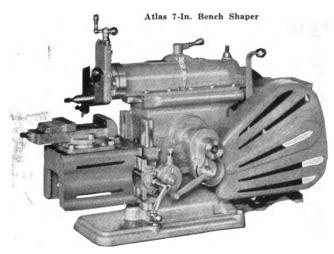
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930-936 W. Hill Street, Louisville, Ky.



C. A. NORGREN CO., Inc.
216 Santa Fe Drive Denver, Colo.





Company, Dept. 4, Kalamazoo, Mich., has been augmented by the addition of a 7-in. bench shaper. The shaper, illustrated herewith, is specially intended for improved efficiency, economy and versatility on small work.

The design of the shaper incorporates accepted principles of modern shaper construction. ram driving mechanism is of the bullgear type; the stroke (quick return) from ½ to 7% Four speeds of from 45 to 200 strokes per minute are available through a V-belt drive from the motor to the bull-gear spindle. Five feeds either direction of between 0.005 and 0.025 in. per stroke are available with an automatic cross feed. Cutting speeds are from 3½ to 116 ft. per minute. The

maximum table travel is 81/2 in. horizontal and 41/2 in. vertical. The maximum distance from the table to the ram is 51/2 in. and the minimum distance is % inch.

The shaper is designed to be operated from a ½ h.p., 1740 r.p.m. motor.

Improved They are made in Anderson the following sizes: Balancing Ways No Leveling Required simple excellent device for balancing, s t r a i ghtening and trueing.

Swing	Greatest Distance Between Standards	Capacity in lbs.
20 in. 40 in.	20 in. 30 in.	1,000 2,000
60 in. 72 in. 96 in.	30 in. 66 in.	2,000 5,000
96 IR.	88 in.	10,000



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Styles 7x17 and 6x13



Developed to meet demand for chucks lower than our standard style.

> Send for folder covering Chucks and Demagnetizers.

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"More For Your Money" is the title of six-page folder featuring Hobart Selec-Motor Horsepower ve Control hich current costs are reduced, power ctor is improved and amount of startg current required is reduced on the c welders built by Hobart Bros. Co., roy, Ohio. The folder includes a checkng chart with which the user of arc elding equipment can check up on arc ength, penetration, fusion, tenacity, and ne rest of the twenty points upon which ne Hobart Arc Welder is said to excel. eatures of the Hobart 40-Volt Simplified rc Welder are explained in detail and ne text is profusely illustrated. Copy ee upon request.

Explosion Tested D.C. Motors. nghouse Electric & Mfg. Company, East ittsburgh, Pa., is now issuing Leaflet o. 20652 describing and illustrating the Vestinghouse Explosion - Tested ooled Totally-Enclosed Type SK Direct urrent Motors. The Type SK Motor is esigned for use in locations where exlosive gases or dust may exist. notor is designed to give the maximum f service and operate with a minimum f maintenance. It is built in sizes om 5 to 75 H.P. and to operate on

115, 230 and 550 volts.

A feature of the motor is accessibility, which is obtained by the use of a double walled bracket on the commutator end. The bracket is equipped with hand hole covers which are readily removable to permit inspection and adjustment of the brushes and commutator. The fan is on the commutator and provides efficient ventilation because the flow of cooling air is not restricted by pulleys, gears, gear cases, and so on. In addition to the feature, the motor is built into a rolled steel frame, has vacuum impregnated field coils and mica insulation on the armature coils.

The Type SK motor is designed, built and tested to stand an internal explosion of gas (methane) or coal dust without injury to the equipment or without emitting flames or sparks which would ignite surrounding gas. The fan on the commutator end forcing a large volume of cooling air through properly located air passages makes possible high continuous capacity with minimum size. guard against the covers being removed by unauthorized persons, each cover is provided with a hole in the web for insertion of either a wire metal seal or chain and lock. Copy of the leaflet is available upon request.



Now you can get your belt hooks on processed card (Pat. Applied For). Not only protects fingers from sharp hooks but holds them to the last hook in correct position. There's no card end waste with WIRE-GRIP—easily cut to size with scissors or knife. Coming in all sizes, easily applied with a WIREGRIP Lacer or any other standard lacing machine. machine.

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Scrap Truck—Top length 46". Bottom length 27 ½". Depth 18 ½". With single caster in rear or lockpin for Clark Lift Jack Unit. Standard and Special Trucks for Every Purpose.



LL STEEL WELDED TI 1123 RAILROAD AVE. ROCKFORD, ILL. 266

"Shapers by Gould & Eberhardt" is the title of a 34-page book describing the line of tool room and manufacturing shapers built by Gould & Eberhardt, Irvington, Newark, N. J. Each type and size of shaper made by this firm is illustrated and described, also each individual unit of the various machines. Phantom views are included showing the internal mechanism, double crank gear transmission, precision lubrication system, and so on. Copy free upon request.

Ajax Flexible Couplings. The Ajax Flexible Coupling Company, Westfield, N. Y., presents in bound form, a collection of data sheets covering the many types of flexible couplings manufactured by this company for the convenience of the engineer, draftsmen and purchasing agent. The contents are confined to the presentation of technical data which will be of real value to those responsible for the design and specifications of equipment. Included, in turn, are descriptions, blue print drawings, specifications, and installation photographs of the Ajax Type 8, Type F, Type SP, and Special Ajax Couplings. Copy free upon request.

Dardelet Self-locking Threads; Bulletin No. 17. This bulletin now being issued by Dardelet Corporation, 55 Liberty St., New York, N. Y., presents the use of the Dardelet Self-Locking Screw thread on cap screws and set screws. text explains how the Dardelet thread remains locked after having been locked position tightened into the whether there is full load on the fastening or no load at all. The locking action is said to be maintained continuously, regardless of changes in load stress or friction against the work bearing surface of the fastening. The bulletin is illustrated with cross-section views of cap and set screws locked and unlocked, photographs of mechanisms in which the Dardelet thread is used, and so on. Copy of the bulletin free upon request.

Barnes Piston Feed Pump. This sixpage circular, now being distributed by W. F. and John Barnes Co., Rockford, Ill., presents the Barnes Piston Feed Pump for hydraulic equipment. This circular is one of a series, each profusely illustrated and dealing with a single phase of the Barnes patented hydraulic structure and system, showing step by step those features of design and construction which are the result of years

of research and actual field performance. The complete series includes pamphlets describing the gear pumps, pamemountings, control valves and fluid etraults, and structural mountings, various

types of drives and fluid reservoirs Copies of the entire series can be had by addressing the W. F. and John Barnes Co. as above.

Fairbanks-Morse Steam Pumps, described in Bulletin 6205, are suitable for a wide range of pumping applications. They have been designed to pump water oil and similar liquids at pressures up to 420 lbs. per sq. in. in quantities up to 464 gal. per min.

Both the F-M General Service and Low Service steam pumps are of the duplex pistons pattern type. General Service units are offered in one-piece and two-piece patterns. In most sizes of Low Service pumps, the steam and fluid ends are cast separately, then assembled, forming the two-piece pattern.

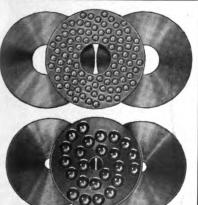
Numerous refinements in design and construction contribute to the extra dependability and efficiency of Fairbanks-Morse pumps. Accurately made parts are carefully assembled by experienced workmen, and completed pumps must satisfy rigorous tests before leaving the factory. Copy free by addressing Fairbanks, Morse & Co., 910 S. Wabash Ave., Chicago, Ill.

Larger Stellite Hard-Facing Booklet. A new and more complete edition of the booklet, "Hard-Facing with Haynes Stellite Products", is now being issued by Haynes Stellite Company, Kokomo, Indiana, a Unit of Union Carbide and Carbon Corporation. This booklet describes well over 500 money-saving applications of the hard-facing process.

This new edition is the fourth printing since the booklet was originally published a little more than three years ago. Over 35,000 copies have already been distributed. New sections present information concerning special Haynes Stellite J-Metal cutting tools and an improved welding technique for fabrication of equipment employing the corrosion-resistant Hastelloy alloys. A number of examples of hard-facing automotive and aircraft valves and valve seat inserts, and the use of Haynes Stellite trim for high-temperature, high-pressure steam valves, are now also described in detail.

Copies are available without obligation from Haynes Stellite Company, Kokomo, Indiana.





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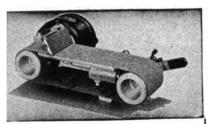
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floor stand is available. All bearing surfaces are large and accurately finished, and complete provision is made for adequate lubrication.

Fellows No. 4B Gear Burnishing Machine

A new type of gear burnishing machine which is designed to handle small fine-pitch gears, two at a time, has re-



Fig. 1.—Fellows No. 4B Gear Burnishing Machine for burnishing small fine-pitch gears.

cently been placed on the market by the Fellows Gear Shaper Company, Springfield, Vermont. This machine, shown in Fig. 1, possesses several unique features:

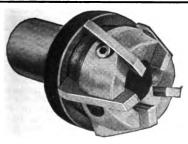
(1) it is arranged electrically so that it is impossible to bruise the teeth of fine pitch gears. This is accomplished by bringing the gears to be burnished into rotative contact with the burnishing gears before pressure can be applied, (2) four "idler" and one driven burnishing gear are used, making it possible to burnish two gears at a setting, (3) the



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... for all types of gears.

DIEFENDORF GEAR CORPORATION Syracuse, New York



GENESEE ADJUSTABLE **HOLLOW MILLS**

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slides carrying the idler burnishing gears are independently operated, so that two gears of different diameters can be burn-

ished at the same setting.

Reference to Fig. 2 will show that the idler burnishing gears are held on adjustable studs on slides, the position of which relative to the driver burnishing gear is controlled by a cam and adjustable cam bars. The cam and cam bars are used to set the slides so that the gears to be burnished, when in the loading and unloading position, are in mesh with the burnishing gears with sufficient backlash to permit easy inser-



HE WALTON COM 98 Allyn St. Hartford, Conn. tion and removal of the work. Then when the operating lever is shifted to the burnishing position, the cam is relieved from the cam bars, allowing the

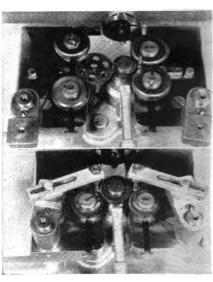


Fig. 2.—(Above)—Close view of Burnishing Gears and Operating Slides—two gears of different diameters being burnished at same setting. Fig. 3.—(Below)—Burnishing Helical Gears-Note adjustable stops to prevent endwise motion of gears when burnishing pressure is applied.

weights at the rear of the machine to apply the necessary burnishing pressure. The work when being burnished is

held on studs which locate it in the proper relation to the burnishing gears. For the ordinary run of work, these sup-ports are held in adjustable bars lo-





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It turns with the work. Eliminates friction of dead center.

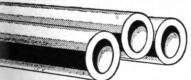
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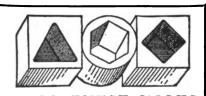
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GALLMEYER & LIVINGSTON CO.

cated in the slides. For very small gears, special supports are attached to the slides, the design of these supports be-ing governed by the size and shape of the work. In burnishing helical gears, as shown in Fig. 3, adjustable swinging supports are employed to prevent endwise movement of the gears when burnishing pressure is applied.

The time of burnishing is automatically controlled by adjustable timing relays having a range of from 3 to 40 seconds. These relays are independently adjustable, permitting burnishing longer in one direction than in the other, if





THESE HOL

By a Quick, Easy, Inexpensive Method business letterhead will bring literature. WATTS BROS. TOOL WORKS Wilmerding, Pa. such action is desirable.

Owing to the design of this machine and the method of operation employed. it is possible to burnish gears at a rapid rate. A gear of 4-in. diameter, 1/16 in. face width can be handled at the rate of 480 per hour, and smaller gears at a proportionally faster rate. The maximum capacity & 4 in. pitch diameter. 20 diametral pitch.

M-B Adjustable Feed Machine Oiler

The M-B Adjustable Feed Machine Oiler shown in the illustration, product

of M-B Products, 130 Larned St. E., Detroit, Michigan, is identical with the M-B Predetermined Feed Machine Oiler which was announced in the August, 1937, issue of MODERN MACHINE SHOP, excepting that the oiler shown here is equipped with means for adjusting the feed of the lubricant. This feature is valuable in cases where the volume of the lubricant varies from time to time.

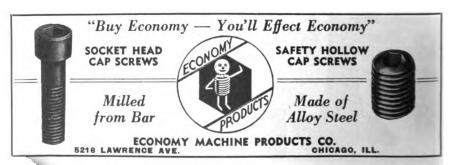


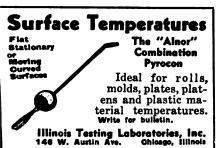
M-B Adjustable Feed Machine

The oiler is made to fit pipe sizes %, ¼, and % in., and is provided in capacities of 1½ oz. and 7 oz.

Procunier Universal Tapping Machine

The line of tapping machines made by the Procunier Safety Chuck Company. 12 S. Clinton St., Chicago, Ill., has been augmented by the addition of the Pro-cunier Universal, illustrated herewith.









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The outstanding feature of this machine is its versatility. The machine is designed to handle an exceptionally wide range of materials and sizes with the maximum production efficiency. The machine has five operating speeds ranging from 365 r.p.m. to 2240 r.p.m. and two interchangeable Procunier Tapping Heads afford a capacity ranging from No. 8 tap to $\frac{5}{2}$ in. inclusive.

Pre-set tapping and reversing pressures independent of the operator are maintained by a unique arrangement of helical springs, adjustable over a wide range. This construction facilitates precision tapping at high speeds with maximum

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Ail Sizes—For Ail
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insert faces are self-tighten-

ing, self-aligning.

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protection for taps and work. Continuous lubrication is automatically provided for the tap only while the tap is in operation. Convenient timing and volume adjustments provide for lubrication in the correct volumes as well as for au-



Procunier Universal Tapping Machine

tomatically starting the flow at the instant desired.

The Procunier Sensitive High Speed Tapping Head, Tru-Grip Tap Holder, precision hand-screw height adjustment of the working table, precision depth stop adjustment, and offset foot pedal which permits the operator to sit facing the work table are a few of the additional features of this machine. Additional chuck spindles are available for external threading.





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With Automatic Feed Wiff Automatic Feed Can be attached to Column Boring Bar, and Drilling or Milling Machine spindles. Single point tool travels radially, from center out-ward or reverse, feeds auto-matically, and covers faces 6" to 30".

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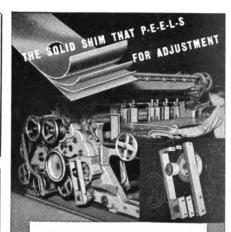
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Tolman Manufacturing Co., 19 West rolman manufacturing Co., 19 westrd St., Boston, Mass., has designed an
electrode holder which has no springs,
is entirely insulated, is fitted with a
fibre handle and with triangular fibre
shields which prevent the holder from
rolling when at rest. It is said that the
holder will not are when laid on the work without the electrode. Overhead welding can be done without slag dropping into the holder end. The electrode is locked in the holder or as easily released by a few turns of the handle.



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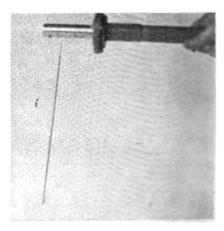


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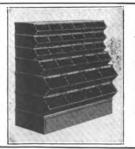


Tolman Electrode Holder

The holder is furnished with or without cable and designed so that the electrode can be inserted either straight or at an angle.

Pyro Bi-Optical Pyrometer

The Pyro "Bi-Optical" Pyrometer. manufactured by The Pyrometer Instru-ment Co., 103-105 Lafayette St., New York, N. Y., is a patented, combined color pyrometer, whose measuring principle was evolved after years of scientific research and investigation, and developed by this firm into a convenient and handy self-contained instrument for practical purposes. The present invention is based on the use of light filters and color wedges which are transparent to a number of colors simultaneously. By using filters with a number of transparencies both for separation and for mixing and toning down, any compli-



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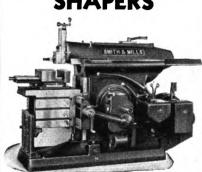
Send Samples of your Work and we will furnish accurate estimate of production and estimate of production and quote cost of equipment.

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SMITH & MILLS **SHAPERS**



Automatic lubrication—forced feed. Multiple disc clutch and brake. Quick feed changes. Direct reading feed and stroke dials. Power rapid traverse to cross feeds.

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New 6" x 6" Peerless Improved High Duty Metal Sawing Machine With Hydraulically Operated Automatic Bar Feed

Automatically feeds the bar of stock forward to the gauge, automatically closes the vise, and automatically continues to repeat the complete cycle of cutting until the entire bar is cut to the length the gauge is set for, all without the attention of an operator.

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Pyro Bi-Optical Pyrometer

the "actual" temperature may be ascertained simultaneously. The instrument is furnished with scale ranges from about 900-1900 deg. C. or 1700-3500 deg. This instrument may be used for innumerable laboratory and research applications including incandescent iron and iron alloys in the open and flame heated furnaces, etc. This instrument will be exhibited for the first time at the forthcoming National Metal Exhibition, Atlantic City.



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Mid-West Piercing and **Drilling Unit**

The illustration shows a unit which has been designed by Mid-West Produc-tion Engineering Co., Inc., 1421 E. Mil-waukee St., Detroit, Mich., to perform both piercing and drilling operations on the metal bowl-shaped parts illustrated in the drawing which can be seen leaning against the front of the machine. The unit was designed to take bowls of three different diameters: 8 in., 10 in. and 12 in. Some of the bowls are pierced only, and some require holes to be drilled in the corner radius as shown in the illustration.

The small holes are 0.085 in. diameter. pierced in 0.107 in. drawn stock. To operate the machine, the operating lever is moved forward, which causes the dies to move out against the work and the four Hydro-Pierce Units to move in and complete the piercing operation. The lever is then reversed upon which the dies move away from the work, the punches are stripped, and the bowls automatically index 9 deg. to the correct position for the machining of the next holes.



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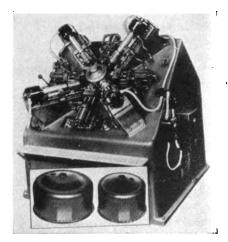
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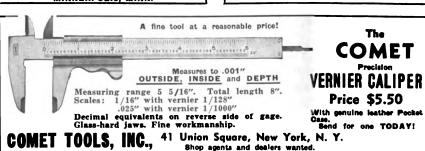
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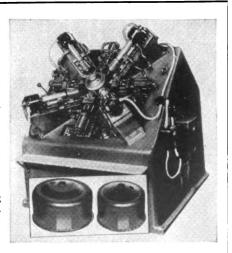
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Link-Belt Book on Power Transmission Pulleys. A new 8-page illustrated list price Book No. 1622 has been completed by Link-Belt Company, Chicago, on the subject of cast iron pulleys for power transmission, giving pertinent data on solid and split, single and multiple arm machine-molded pulleys, with and without rubber lagging.

A copy of the book will be mailed to any interested reader upon request, which may be addressed to the nearest office of the company.

The "Flame-Otrol" is the name given to a gas burner safety device, designed to shut off the gas and prevent explosions in case of flame failure. It effectively safeguards against loss of life, property damage, and tie-up of production schedules. The Flame-Otrol is a product of Wheelco Instruments Co., 1927 S. Halsted St., Chicago, Ill. This company is now issuing an eight-page circular in which the uses of the Flame-Otrol are explained and illustrated. Copy free upon request.

Lignum-Vitae Mallets and Mauls. The complete line of wood mallets and mauls made from Lignum-Vitae, hickory or dogwood by Lignum-Vitae Products Corporation, 100 Boyd Ave., Jersey City, N.

J., for the use of metal workers, tinners, stonecutters, foundry workers, boiler-makers, coppersmiths, and other mechanics, is described and illustrated in a four-page folder which is now being distributed by the above firm. Specifications and prices are included. Copy free upon request.

Hevi Duty Type MU-55 Multiple Unit Furnace Bulletin. This bulletin, now being issued by Hevi Duty Electric Company, 4212 W. Highland Bivd., Milwaukee, Wis., presents the features of the Type MU-55 Multiple Unit Furnace with controlling pyrometer. This furnace is especially designed for heavy laboratory or light tool room work and is equipped for automatic control of the temperature. This bulletin explains the temperature range, gives details of the construction, and explains the control and operation and voltages. Specifications are included. Copy free upon request.

Gisholt Boring Bars and Reamers. This eight-page bulletin contains complete specifications, prices and descriptions of the boring bars and reamers made by Gisholt Machine Company, 1217 Ave., Madison, Wis. Washington Various outstanding rigid cutter support, and so on, are clearly illustrated by the use of photographs and drawings. The text explains the manner in which ample chip clearance and maximum rigidity are obtained in the boring bar by the use of a patented spiral groove. Solid or adjustable blades may be used in the bars and special bars with several cutters are Various types of Gisholt manushown. facturing type reamers of the solid adjustable type are illustrated and described. Copy free upon request.





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Janette Bulletin 227. Janette "Precision Built" Generators, Motor Generators, Motorized Speed Reducers, Electric Motors, Blower Wheels, Motorized Blowers, Rotary Converters, and other equipment made by Janette Manufacturing Company, 556 W. Monroe St., Chicago, Ill., are described and illustrated in Bulletin 227 which is now being issued by this firm. Copy free upon request.

Duff-Norton Lifting Jack Catalogue. The Duff-Norton Manufacturing Company, Pittsburgh, Pa., announces the publication of a colorful and well illustrated new catalogue describing their complete line of Lifting Jacks for Mine, Railroad and Industrial Use.

Copies of this handy and informative new catalogue are available by addressing this magazine, or by writing the manufacturer direct.

The Rex World, Vol. 3, No. 1, presents the Rex conveyor, product of Chain Belt Company, Milwaukee, Wis., in a variety of designs. Two pages of the folder are devoted to photographs and descriptions of Rex conveying equipment in a meat packing house. The use of Rex conveyors and chains in the oil well industry, asphalt industry, coal industry, paper manufacturing, and so on, is also outlined with typical illustrations. Copy free upon request.

Celeron Coupling. Moulded Plastic. A technical bulletin describing the construction, uses, and advantages of the Celeron Moulded Plastic Coupling is now being distributed by the Continental Diamond Fibre Company, Newark, Del. The bulletin particularly features the tests that have been applied to the coupling, in which the steel shaft supporting the coupling was broken without fracturing the coupling in any way. The various features of the coupling are expained and a table of specifications is included. Copy free upon request.

Ingersoll Ray Blade Cutters. The features of standardization and extensive application of the Ingersoll Ray Blade are described in detail in an eight-page circular now being distributed by The Ingersoll Milling Machine Company, Rockford, Ill. Data and prices covering Ingersoll Face Mills, roughing and finishing, medium and heavy duty types, Ray Blade End Mills, Cemented Carbide Cut-

ters, and Core Drills and Reamers, are listed. Information on the assembly and grinding of Ray Blade Cutters is also included. The booklet is well illustrated with photographs and cross-section drawings of the various tools described. Copy free upon request.

Precision Adjustments By Simply Peeling Laminum is the title of a 16-page catalog, in colors, explaining the uses and advantages of the laminated shim brass marketed under the trade name of Laminum by Laminated Shim Company. Inc., 21 44th Ave., Long Island City, N. Y. The text explains how the multiple layers of special-alloy precision-thin shim stock are laminated, with a microscopic layer of metallic binder, into a unit structure from which the laminations can be peeled as required in thickness of either 0.002 or 0.003 in .- or more—at a time. The book is profusely illustrated with pictures of different kinds of mechanical jobs upon which laminated shims are used and drawings are included.

Lee Direct Fired Unit Heater. Industrial buildings require heat for a relatively short time each year and the cost of fuel for line losses and for maintaining steam pressure to prevent freezing is sometimes greater than the cost of the fuel actually delivered as heat. The complexity and high operating cost of steam systems and resulting low efficiency have in the past been largely unavoidable. The ideal heating plant is one that would deliver to the desired locations every heat unit originally contained in the fuel. According to the text matter contained in a catalog which is now being distributed by Dravo Corporation, Machinery Division, Pittsburgh, Pa., the Lee Direct Fired Unit Heater System is a close approach to such an ideal for large buildings such as factories, warehouses, steel plants, garages, and so on.

This catalog contains 20 pages of description of the Lee unit. The text is profusely illustrated with photographs. phantom views, and drawings showing the different types and sizes of units for use under various conditions, and data and specifications are included which will aid the prospective user to select the type which will best fit his needs. Copy of the catalog free upon request.

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Fairbanks-Morse Fig. 5870 Ball Bearng Centrifugai Pumps are illustrated nd described in a new Bulletin No. 870. These compact, sturdy pumps are uilt especially for operating at high peeds against heads up to 245 ft., with apacities of from 90 to 225 U.S. galons per minute. Efficiency and comactness are said to make them desirble for installations requiring high ressures and small or moderate capaciles, such as in municipal waterworks, adustrial plants, golf courses, parks, and on. Copy free upon request.

National Oil Extractor. This bulletin, ow being issued by The Leon J. Barett Company, Worcester, Mass., lists the alient features of the National Oil Exractor and explains the mechanism by hich 98½ per cent of all removable oil an be reclaimed from turnings, borings nd chips. Centrifugal force is the priniple employed and the outstanding feaures of the extractor are both rigidity f construction and ease and freedom f operation. The bulletin dwells speifically on the self-contained outboard notor drive, free center pins, anti-riction ball bearings, absence of noise nd vibration, forced lubrication, standrdization of parts, stabilization of the pindle, and safety features. A table of pecifications is included. Copy free.

Bulletin T-12 of Technical Informa-ion on Monel, Nickel and Nickel Aloys. This bulletin comprises a 14-page iscussion of the subject of machining fonel, nickel and Inconel, written by V. F. Burchfield. Mr. Burchfield begins he discussion with a section on the hoice of materials and then takes up n turn stock for machining, tool deigning, clearance angles, rake, tool teel, heat treatments of tool steels, cuting compounds, cutting-off operations. urning, boring and drilling the metals under discussion, reaming. tapping. lathe threading, thread chasing, planing, milling, and precision grinding.

The center double page consists of a drawing illustrating the correct manner of grinding tools for machining Monel metal, nickel, or "K" metal. All clearance angles, rakes, and so on, are indicated for lathe, planer, and shaper tools, threading tools, boring tools, taps and drills.

Copy of this bulletin can be had by addressing The International Nickel Company, Inc., 67 Wall St., New York,



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Westinghouse Motor Driven Weiders. Westinghouse Flexarc motor driven welders and bare generators are described in a recent publication. Application, construction, specifications and performance curves for single operator 200, 300 and 400 amperes welders are included. Copies of the publication are available from the nearest district office or direct from Department 5-N, Westinghouse Electric & Manufacturing Company, East Pitts-

burgh, Penn.

"Magnetic Separator Type "AM" " Bulletin, issued by the Stearns Magnetic Mfg. Co., Milwaukee, Wis., and detailing the construction and operating characteristics of this specially designed magnetic separator which utilizes AC current for greater pulsating agitation in the treatment of fine dry material. Copy free upon request,

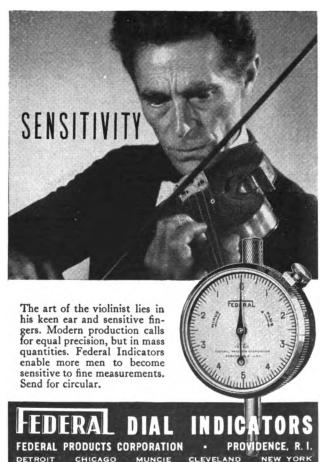
Heat Treatment Fundamentals of Nickel Cast Iron, Plain Cast Iron, Nickel-Chromium Cast Iron and Nickel-Chromum-Molybdenum Cast Iron. Metallurgists working unceasingly to discover new and seful combinations of elements have been no less diligent in efforts to improve structural and mechanical properties of long established materials. As a natural development, metals whose isefulness has heretofore had definite imitations, have had their industrial mportance greatly enhanced.

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parts of great size requiring little hardness, strength. or resistance to neat, wear and corosion, its uses are low marked by heir diversification. Modern foundry orocedure, employng heat treatment. dloying and closer netallurgical conrol, has done much the imassure provement of all properties listed by improving ınd. miformity of proprties and machinibility, has dereased rejections by oundry, machine shop and other inpectors.

The improvement of cast iron by heat is reatment cussed in a 16-page pulletin which is 10w being issued by International Гhе Tickel Company, nc., 67 Wall St., New York, N. Y. The oulletin takes up in urn the subjects of Critical Ranges of Critical Cast Iron, Cooling Rate, Stress Relief, Effect of Anrealing Temperature n the Hardness of Cast Iron, Annealing Ano r Softness. aealing Semi-Ausenitic Irons for Iardness, Quenching, rempering for Hardness, Quenching Followed by Tempering for Strength, Air Hardening. The last two pages are devoted to a glossary of terms for iron and steel and definitions relating to heat treating operations. The bulletin is well illustrated with photographs and drawings. Copy free upon request.

"The Fable of the Tough Beard and the Dull Razor" is the title of an entertaining booklet on the dressing of grinding wheels, now being distributed by Koebel Diamond Tool Co., 1202 Oakman Blvd., Detroit, Mich. Copy of this "fable in slang" free upon request.



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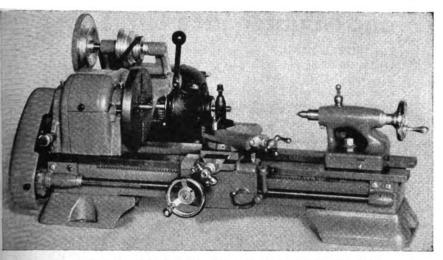
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ECAUSE it is Self-Priming, The "Logan" Sure Flow is adapted to an unusure wide range of services. It pumps hot or cold liquids; and safely handles chifilings, abrasives and most corrosive impurities. The "Logan" Sure Flow, with its vertimotor drive, simplifies installation and saves space. It can be mounted entirely away for the source of supply. No part of the pump need be submerged. No foot or check value is needed in the line.

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1

Another Atlas Bench Lathe Standardized on TIMKEN Bearings



Latest Atlas Bench Lathe. Spindle mounted on TIMKEN Bearings.

Why is it that so many bench lathe manufacturers are swinging to Timken-equipped spindles? A boiled-down answer given by the user of Timken-equipped lathes might run—

"I must have precision lathes to produce a precision product. I don't care to "bicker" about the accuracy of one bearing over another. I know that when I specify TIMKEN Bearings on my bench lathe spindles accuracy is assured."

Can you afford to "bicker" about spindle bearings when 95% of all new heavy-duty machine tools have Timken-equipped spindles?

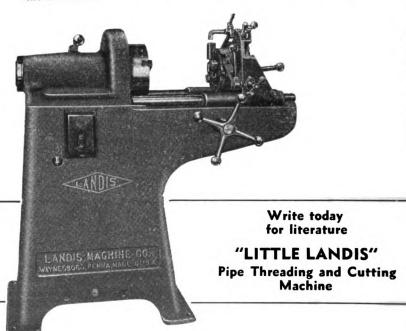
THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

Manufacturers of Timken Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; Timken Alloy Steels and Carbon and Alloy Seamless Tubing; Timken Rock Bits; and Timken Fuel Injection Equipment,



<u>Unexcelled</u> for Jobbing and Maintenance Threading

The "LITTLE LANDIS" has no equal for efficient, economical service in threading pipe and bolts for jobbing or maintenance work. This new LANDIS machine has a built-in gear box to insure efficient operation on all diameters. It employs the patented LANDIS Chaser whose free-cutting action and long life keep tool costs to the minimum.



LANDIS MACHINE CO., Inc.

WAYNESBORO, PENNA.

Somewhere in the HEALD LINE



Whether it is for work with a bore as small as .078" or parts that require a swing of 42", Heald has just the machine designed and built for the job.

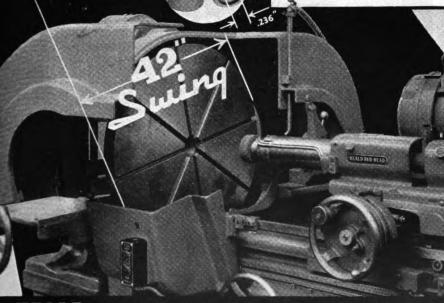
Again, regardless of whether you are a manufacturer having the heaviest of mass production where fully automatics are demanded or tool room work with a wide variety of work requiring a very universal tool, a machine from the Heald line can be selected to exactly meet requirements.

Look to Heald for Precision Grinding and Precision Boring.

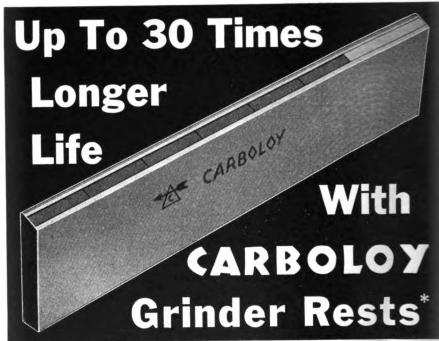
DIAM. BORE

The No. 81 Internal at left is a small machine arranged for high speeds and handles very small to medium size work. It is shown equipped to grind the bores and valve seat of Diesel engine nozzles. The No. 174 Internal below is a big.

The No. 174 Internal below is a big, powerful gap machine for extra heavy duty and has a swing of 42". The machine shown was arranged for grinding bore, face and O.D. of hot mill shear knives.



E HEALD MACHINE CO., WORCESTER, MASS., U. S. A.



Carboloy—the extra hard, extra wearresistant metal will give you long periods of extra life on your centerless arinder rests.

Not only will you get up to 30 times longer life but also greater continuous accuracy, reduced machine down time, lower operating costs, reduced scrap and a higher quality of work.

Write for descriptive leaflet.

CARBOLOY COMPANY, INC.

CHICAGO

CLEVELAND PITTSBURGH DETROIT PHILADELPHIA

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*CARBOLOY-FACED CENTERLESS GRINDER RESTS.



On one installation reported the life of Carboloy rests ranged up to 575,000 pieces per each reconditioning of she rests, as compared to an average of 1,600 pieces per reconditioning with high speed steel.

Send for Descriptive Leaflet

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CENTERLESS
GRINDER RESTS

Carbotoy Co., Inc., 2910 2. Jeneson, 2011
Send free leaflet describing the greater accuracy possible with Carboloy-faced grinder rests.

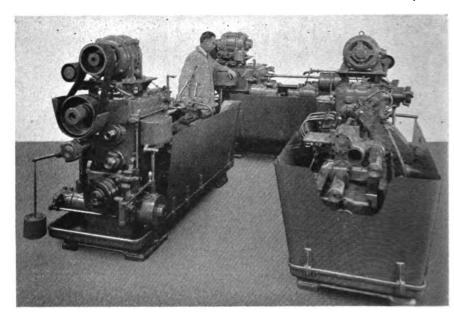
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Machine Shop

HOWARD CAMPBELL, Editor

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WITH THE J & L AUTOMATIC DOUBLE END MILLING AND CENTERING MACHINE



In one automatic cycle, the J&L Automatic Double End Milling and Centering Machine mills bars to length and centers them to uniform depth. This one machine replaces the duplex mill and the double end centering machine, and, when used with a pair of turning machines, one operator can run all three machines. Consider the saving in upkeep, initial investment, 'floor space, and labor offered by this one machine.

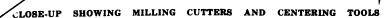
An automobile manufacturer is getting outstanding production with his J&L Milling and Centering Machine. One-eighth inch of stock is removed at each end of a bar 1½ inches in diameter. The bar is then centered at both ends. A floor to floor time of 17 seconds is obtained. This is an average production of 1300 pieces per eight hour day.

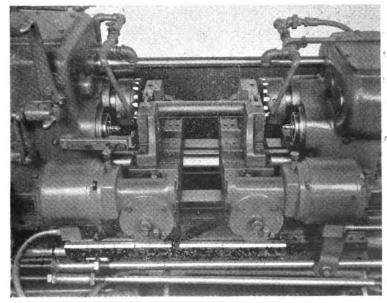
This machine may be used to advantage on small lots or mass production. May we estimate the profits available to you on a similar job?

JONES AND LAMSON MACHINE COMPA

Springfield, Vermont, U.S.A.







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Increased



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in eight hours, consistently.

roduction 7

TEP-UP in production of 800 to 1700 ags finish ground to a limit of .0005" in our day—more than 100%.

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vility...operating convenience...simy in setting up...ease of manipula..separate motions combined into one istance, headstock spindle rotation colant flow both automatically turned instant table is stopped)...these and

time-saving features are swer to increased producithout extra cost.

or Circular No. G-394. You appreciate the informative ta it contains.





CINCINNATI GRINDERS INCORPORATED CINCINNATI, OHIO, U. S. A.



VASP is Versatility, Accuracy, Speed and Power—equally built into the Knight Miller.

VASP is the **balancing** of these four qualities — to give you the utmost utility in one machine.

The No. 40 Knight Miller has the VERSATILITY to

handle a wide range of work—can split thousandths on a job requiring ACCURACY—boosts profits on the work calling for SPEED—meets the jobs that demand POWER.

Write for further information.



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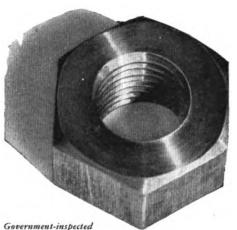
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FELLOWS

GEAR SHAPERS AND GEAR SHAPER CUTTERS

TAPPING OUTPUT



Government-inspected stainless steel mut, from 4-spindletapping machine. Prior to use of Texaco Sultex B, only one spindle could be operated, and that at reduced speed.

MANUFACTURERS facing tapping problems in alloy steel will be interested in the experience of the Harrison Bolt & Nut Co., Harrison, N. J. They have more than quadrupled their output ... simply by changing over to Texaco Sultex Cutting Oil B.

Sultex B could make this enormous increase in output because it gets down between the cutting edge of the tap and the chip, in this way re-

ducing the friction, preventing abrasion, assuring satisfactory finish of each thread.

Attempting to handle this job with another cutting compound, three out of the four spindles were idle, tap breakage was heavy, finish wouldn't pass the necessary Government inspection.

Trained engineers are always available for consultation on the selection and application of Texaco Cutting and Soluble Oils. Prompt deliveries assured through 2070 warehouse plants throughout the United States.

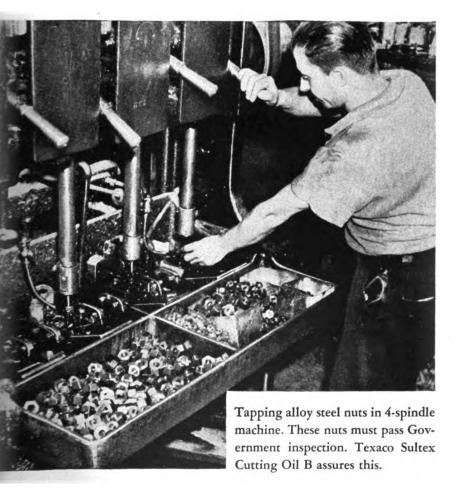
Start using Texaco Sultex Cutting Oil now and increase life of cutting tools.

The Texas Company, 135 East 42nd Street, New York City.

Put new life into your cutting and grinding operations with... Texaco Sultex Cutting Oil—A.. Texaco Sultex Cutting Oil—B... Texaco Sultex Cutting Oil—B... Texaco Sultex Cutting Oil—Careo Soluble Oil—Careo Solub



QUADRUPLED!

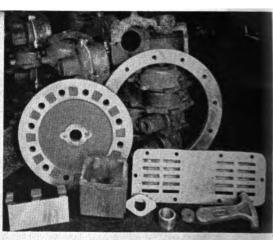


SULTEX CUTTING

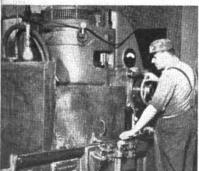




No. 18 BLANCHARD



FOR HEAVY DIESEL AND GAS ENGINE PARTS



This No. 18 Blanchard Surface Grinder in shop of large manufacturer of Diesel Engines and Gas Engines.

Grinds:

Connecting Rods Manifolds Cylinder Head Plates Diesel Cylinder Heads

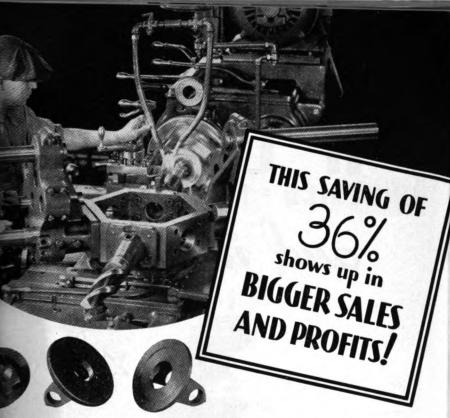
Materials are:

Steel Forgings Semi-steel Castings Cast Iron

Ground from the rough, 1/8" to 1/4" stock per surface. Many pieces are held to ±.001".

BLANCHARD MACHINE COMPANY

64 State Street CAMBRIDGE, MASS.



langed yokes are beld to close (±.001" on the outside rim the reamed hole). Both operare now performed at the me which was impossible on ipment formerly used.



FOR THIS NEW LOG OF SMALL TOOLS

sup with the new improve-tal shorten set-up and machin-e. Write for your copy of the shoil Catalog of Standard Tools 3.4 and 5 Ram Type Universal

TURRET LA

Sizes range from 1" to 12" bar capacity—up to 34" chucking capacity

 Here's another concrete case where modern Gisholt equipment cuts a large slice out of production costs and the savings are reflected as greater sales and profits! By installing a new Gisholt 1L High Production Turret Lathe, this wellknown manufacturer combined on one machine, the work formerly done on two other lathes. Equipped with modern Gisholt Standard Tools, the new Gisholt greatly reduced machining time-cut the cost of producing 5,000 each of four different parts from \$3,005 to \$1,907a saving of \$1098 or 36%.

These features, combined only in Gisholt Turret Lathes, are responsible for this saving

- Heavy, rigid machine construction permits higher cutting speeds and multiple cuts with greater precision and accuracy.
- ★ 12 speed transmission with double-multiple disc clutch for starting and reversing saves time with direct shifting from forward to reverse.

 Automatic spindle brake
- stops the spindle quickly
- without loss of time-provides faster positioning of fixture for removing or chucking new parts in the machine.
- Power rapid traverse to the tool post carriage (in both directions-cross and longitudinal) quickly brings the cutting tools into position with a minimum loss of time and without physical effort.
- Power rapid traverse to the hexagon turret carriage-both forward and backward,
- ★ Quick indexing and clamp-ing of the square turret tool post saves time in carrying through a cycle of operations.
- Easier, faster operation with simple controls and less effort on the part of the operator.

Now is the time to tool up for reducing manufacturing cost. Why not get full information on these new Gisholts? Write us today.

GISHOLT



With the FOSDICK Combination Drill and Jig Borer, you can duplicate parts without the aid of jigs. That's economy! The price of this production machine is within reach of practically every metal-working shop.

12 Spindle Speeds from 60 to 1500 R.P.M.—9 Feeds from .0025" to .026"—Spindle Travel 9"—Working Capacity 24" from Spindle to Table—Table 18"x38".

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THE FOSDICK MACHINE TOOL CO.

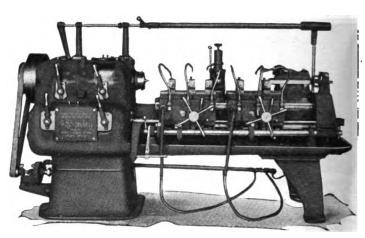
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18

The OLD CHAMPION is STILL CHAMPION



4" and 8" Lo-Swing LATHES

FLASH!

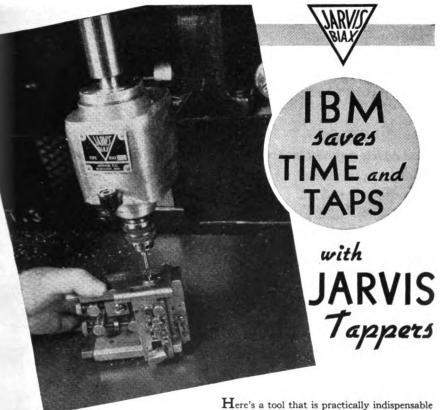
There are twelve 4" Lo-Swings in the present manufacturing schedule that are available for November and December delivery. Why not get one now and let it start earning money far you? In the past few years some remarkable lathes have been developed for turning shaft work in large quantities—we have developed a few ourselves. Where large quantities are involved, these machines have made it possible to materially reduce turning coats.

However, when it is necessary to turn shaft work in small and medium size lots, we believe the 4" and 8" Lo-Swing Lathes will produce a lower total cost than any machine available. We are encouraged in this belief, because concerns who have used these machines for years—a great many of them of national importance—continue to place repeat orders with us. Undoubtedly, when these concerns figure turning costs they take into consideration not only the direct labor cost, but also the cost of maintenance, depreciation and interest on the investment—in other words, they figure the total cost.

Since these machines are saving money for others, why not send us blue-prints of some of your shaft work so that we may submit turning estimates for your consideration?

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TURNING ECONOMIES BEGIN WITH A LO-SWING PROPOSAL



to most high production drilling and tapping departments.

The BIAX TAPPER steps up production, taps more holes between grinds and actually makes broken tap loss almost nil.

The JARVIS BIAX above was photographed "in action" in the drilling department at the International Business Machines plant.

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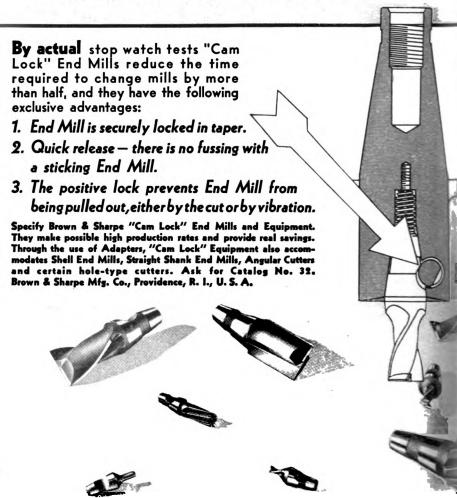
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The R. K. Le Blond Machine Tool Co. Cincinnati. Ohio. Dept. Here's my quarter . . . send the boo Address (or Co.) III gltized by Google

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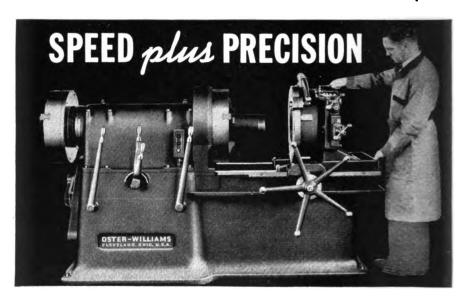
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Grind the scientifically correct point. No special skill required.

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68 Sizes and Types of Lathes for every purpose.

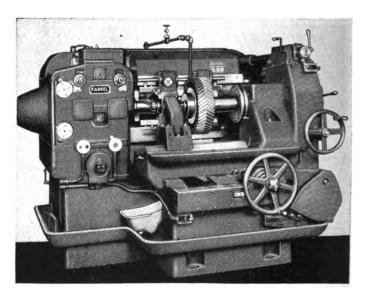
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Bulletin No. 15-C Illustrates, describes and prices the different models of the 15-inch lathe. Copy sent free, upon request.

SOUTH BEND Precision LATHES



FARREL-SYKES 2-C GEAR GENERATOR

The
UNIVERSAL
AUTOMATIC
GEAR MACHINE

for

high PRECISION

high PRODUCTION

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suitable for LINE PRODUCTION GENERAL JOBBING

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The new Farrel-Sykes 2-C Gear Generator has been designed and developed to provide the utmost precision with high speed operation in the generation of gears of all types which operate on parallel axes and a variety of toothed forms and special contours.

Its in-built precision results in quiet operation, long life and low upkeep, and in the production of precision gears which operate more smoothly and quietly, and with greater efficiency and durability. Automatic features make the 2-C machine extremely easy to operate and contribute to the high output which places it in the first rank as a profit-making tool wherever used.

Capacity: 0 to 25" diameter; 24 D. P. to 3 D. P. helical and 2½ D. P. straight teeth; 0 to 8" face.

Complete information and specifications on request.



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181 YULCAN STREET - - - BUFFALO, N. Y.

The Grar with a Backbone



- Can be furnished to turn tapers at one setting the full length capacity between centers of the lathe;
- 5. Can be furnished with contour turning or boring attachment.

Length Turning Capacity Now Multiplied

Monarch Anti-Friction Bearing Taper Attachment, when sipped with the taper attachment Variator, will turn any er within its capacity for the full length between centers of lathe . . . and at one setting of the taper attachment:

by one set of pick-off gears, for the geared bed bracket, is uired to increase the length turning capacity of the taper achment (at one setting) to the maximum length turning acity of the lathe. Equipped with this set of change gears, is possible to turn any lesser length of taper and any lesser ree of taper, setting the swivel of the taper attachment . . . ording to a simple formula furnished with each attachment.

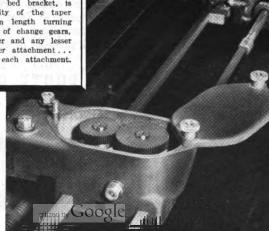
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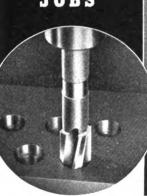
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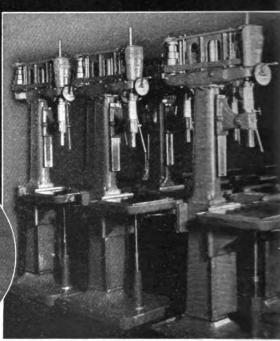
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TOUGH DRILLING JOBS





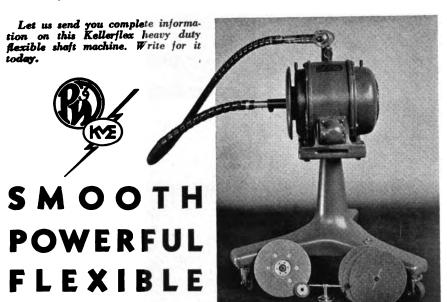
THEN toolroom or production lines need a husky drill for counterboring or countersinking work, the No. 2 Footburt Sipp with back gear unit will fill the bill. Slow speed of 185 R.P.M. and high speed of 2300 R.P.M. provide a range for a wide variety of jobs.

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FOOTBURT SIPP DRILLS



THE KELLERFLEX DL-6 Heavy Duty Machine

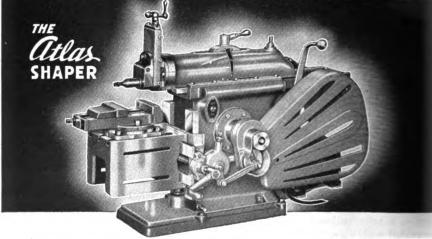
Equipped with a 2 H.P. heavy duty ball bearing motor, 3450 R.P.M. at 60 cycles, totally enclosed, air-cooled, and provided with a special deflector easting. The motor bracket is ball bearing mounted, and swivels 360° horizontally in an oil reservoir on a heavy cast iron tripod pedestal. For sanding the standard cable is 9/16"x6½' heavy duty, and wound for strength, light weight and flexibility. This cable runs in a heavy duty, non-shrinking rubber fabric sheath designed

to resist oil, heat and abrasive. It is made with an inner spring steel liner strengthened by wire mesh. The complete sheath is reinforced at both ends by heavy flat coil supporting springs. As shown the machine is equipped with a right angle attachment.

If your finishing work includes heavy grinding, sanding and polishing on large pieces, write for complete information on this machine. It will prove an economical investment.

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All the features of larger machines are embodied in this new Atlas—precision.

power, rugged strength, and more versatility—at a price that sets a new standard of value in metal shapers. The drive is standard bull type powered by V-belts from motor to spindle. There are four speeds between 45 and 200 strokes a minute, five surface feeds in either direction.

We want every executive concerned with problems of tool room and shop to know about this new Shaper. If you haven't written yet, do it now.

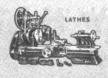


1146 N. Pitcher St. Kalamazoo, Michigan



SHOP

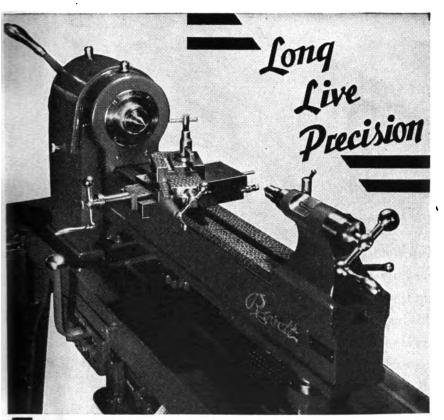
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Timken zero precision mirror finish roller bearings — dynamic balance of every rotating part — accurate gauging and inspection

TO KEEP PRECISION

Maximum slide areas — sturdy construction — three point bed mounting — perfection in material and workmanship





Most taps are broken because of lack of concentricity. Since ALCO Tap holders are so adjustable — and easily adjustable — that absolute concentricity is assured, you can insure your taps by equipping your screw machines with ALCO Tap Holders. And this insurance is at a low rate, for the cost of the ALCO Tap Hold ers is soon amortized by your savings in tap expense . . . and bush ing expense, for these tap holders, like the ALCO Drill Chucks. eliminate the necessity for bushings. But just as important possibly even more so-is the fact that the ALCO Tap Holder will produce more accurate threads. Just these features alone are sufficient to justify your placing your order immediately for a sufficient number of ALCO Tap Holders to modernize your screw machines. There are other important exclusive features, so, if you want to keep pace with modern production practices and we are sure you do-write today for full particulars. The Alco Tool Company, Bridgeport, Conn., U. S. A.

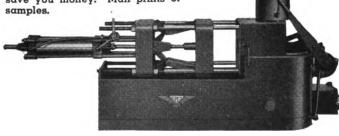
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This revolutionary machine eliminates "farming out" castings, split profits and uncertain production. Now you can cast your own products; make the profit yourself and have your castings when you want them. The Harvill costs only about one-half as much as other pressure die-casting machines of equal capacity, offers maximum production at minimum maintenance cost — can be operated by unskilled labor.

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MACHINES

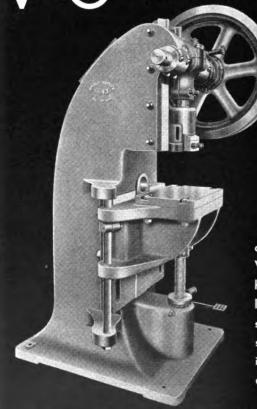
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This photograph shows one of the many horning presses V&O makes. These machines have all of the outstanding V&O Inclinable press characteristics, such as the long slide, eccentric shaft, and over-hanging bearings, etc. Write for a bulletin on these machines.

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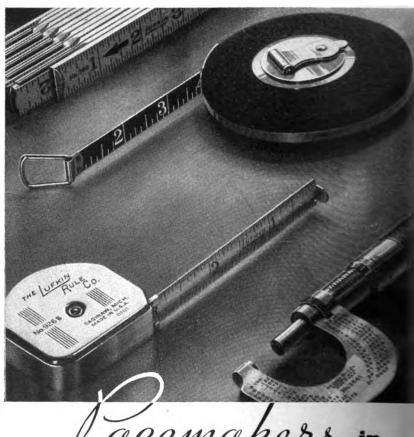
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Evaporator coil assemblies—

a tough job "licked" by GARDNER-GRINDING!

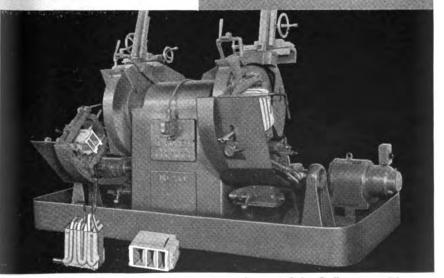
The bottom surface of these cast aluminum evaporator coil assemblies is ground flat within $\frac{1}{44}$ ", at an average rate of 60 per hr., per operator, on this No. 230-30" Gardner Grinder. Stock removal runs from $\frac{1}{16}$ " to $\frac{1}{26}$ ". The two mechanically oscillated work tables reduce

manual effort to a minimum. The job

is ground wet.

THESE refrigerator evaporator coil assemblies represent a tough grinding job because of their size, and because they are aluminum castings with a fairly thin wall section. The largest measures 12½" wide x 10½" high x 11½" long, and the bottom surface is ground flat within ½".

The machine that "licked" this job is a Gardner No. 230-30" Grinder carrying two power-operated work tables, and our standard wet grinding system. A special hand-clamping fixture is mounted on each table, and two operators are used. Brief production data is printed above the illustration.

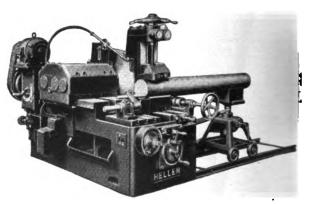


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• Every phase of cold sawing is covered by Heller.

"Triple Economy" invariably results when Heller furnishes Blades. Cold Metal Sawing Machines and Blade Sharpening Machines, and coordinates the application of three essential pieces of equipment to the job at hand.



We would like an opportunity to prove that the

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responsible to the same blade has already proved a sensation. It's an entirely new type—superough, super-flexible, extra hard—a general purpose blade that stands a remarkable amount of abuse without stripping on thinnest sheet or tubing. Its performance on large sections, drill rod, ool steels, etc., is amazing. TUF-FLEX cuts smoothly, efficiently, is practically unbreakable.

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Drop-forged from a selected quality carbon steel, specially processed, Williams' "Superior" Wrenches are so designed that they provide a better hand grip than the usual thin Alloy Wrench as well as increased bearing on the nut. Available in 50 patterns—more than 1,000 sizes. Demand Williams' "Superior" Wrenches from your distributor.

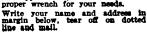
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Every mechanic and tool buyer needs this helpful, informative book-let. Complete tables give correct wrench opening for U. S., S. A. E., American Standard Nut and Cap Screw sizes. Data on wrench types and applications, how to select the proper wrench for your needs.

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1. All patterns and sizes of Williams "Superior" (carbon steel) Wrenches average 93% as strong as Williams' Alley Superrenches" of corresponding dimensions!

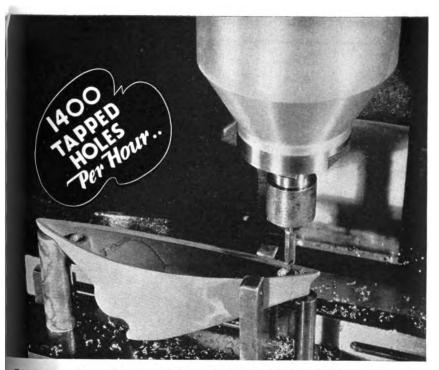
2. Williams' Alloy "Superrenches" are as strong as ANY alloy wrenches made com-mercially!

Wrenches are actually STRONGER than Alley "Superrenches" in the double head Engineers' Pattern, which is of popular thinner design. Also they previde increased bearing on the nut and better hand grip than the usual thin Alley Wrench. Since Williams' "Superior" Wrenches also cost much less:

WE DEFINITELY RECOMMEND

"Superior" Wrenches (impreved Carbon Steel) for most industrial uses.

"Superrenches" (Alley Steel) of the this type for automotive and ether cless-quarter work, or where the user is willing to pay more than 50% extra for higher finish and chrome-plating.



Trouble-makers, these odd-shaped die castings. With other types of equipment the handling time for this job was much greater than the tapping time, resulting in low production, unnecessary operator

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But the Haskins Method makes another tough job easy. A simple sliding fixture — no clamps — operator fatigue reduced to a minimum — production increased to 700 pieces per hour!

Have high-speed, precision tapping in your plant. Have longer tap life — lower tapping costs—at no extra cost over your present method. Investigate the Haskins Method.



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PROOF— illustrated
above is No. 84 of a
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showing tough jobs made
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faster — by the Haskins
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Write for a complete, illustrated booklet describing the Haskins Tapper in detail. R. G. Haskins Company, 4667 W. Fulton Street, Chicago.

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44



A MAGNETIC CHUCK THAT'S DIFFERENT

work during a machine operation and this same chuck DEMAG-NETIZES the work it has held.

THE KAR DUO MAGNETIC holds

The all aluminum body of lesser weight reduces wear and tear of grinding machine.

Finest materials accurate construction, and thorough tests insure long a n d satisfactory service.

SINE ANGLE PLATE

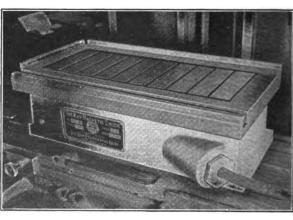
For measuring angles in any part of the quadrant within one minute or less—only a two inch micrometer is necessary.

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time saving accessories for use on any magnetic chuck.



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LOWERS COSTS IN THE TOOL ROOM AND ON THE ERECTING FLOOR

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A Direct Connected
Motor Driven Disc Grinder with
sturdy 3 H.P.Motor and Push Button
Control. Has spindle mounted in
High Grade Ball Bearings and
carries eighteen inch Besly Titan
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micrometer adjustment. Heavy Welded Steel Exhaust Type Guards and efficient Truing Device. You will be surprised at its reasonable price.



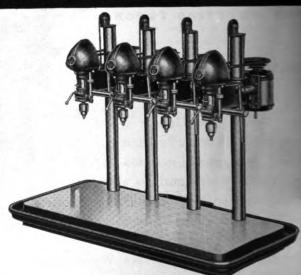
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This four-spindle unit is a very popular machine for manufacturing operations. It is economical in first cost, in power consumption and in maintenance; it is adaptable to wide variety production work in the large or small shop and will pay for itself in an astonishingly short time.



Overall dimensions: 26" x 57"; 45" high. Table surface on base: 2014" x 51". Oil trough 2", tapped for ½" pipe at rear. Maximum distance, chuck to table, 25". Center to center distance of spindles, 11". Capacity of Jacobs chucks, No. 60 to ½" drills. Drills to center of 14" circle.

Spindle speeds, Nos. 1001 and 1002: 590, 1275, 2450 and 5000 r. p. m.

\$26500

With Geared Chucks, less motors.

Spindle speeds, Nos. 1003 and 1004: 390, 745, 1280 and 2050 r. p. m. Spindle carried on New Departure self-sealed ball bearings; lubricated at the factory for the entire life of the bearing. No further lubrication necessary. Spindle pulley is also carried on New Departure self-sealed ball bearing, and is designed to take all belt pull; no belt load transmitted to spindle. Spindle is double-splined, with large radial spline faces for long wear and sensitive

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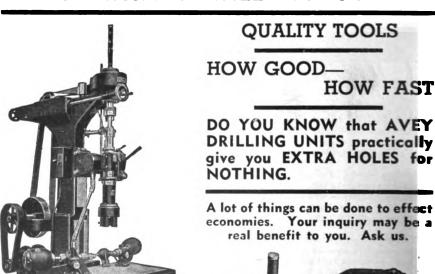
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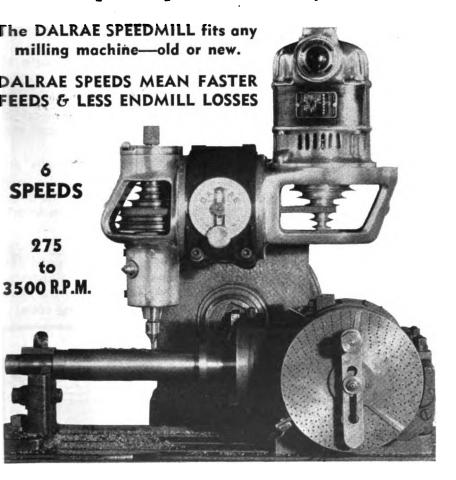
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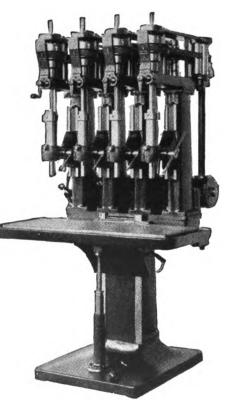
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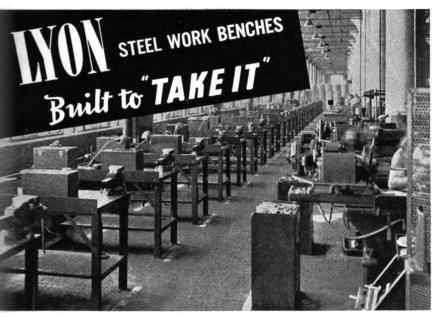
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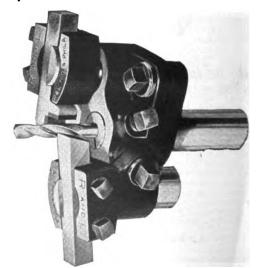
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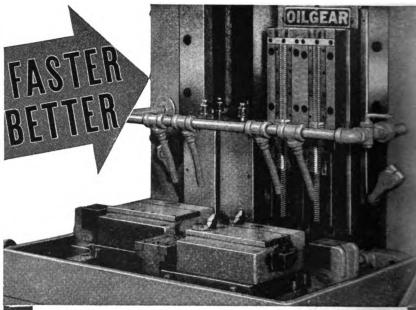
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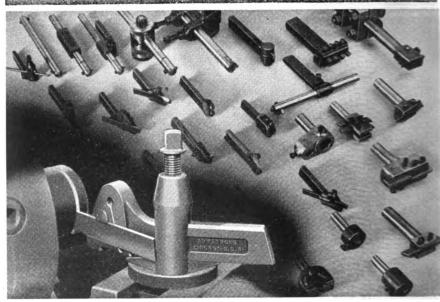
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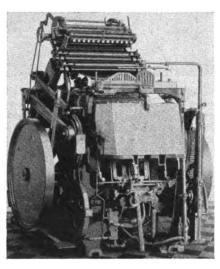
OVEMBER, 1937

Vol. 10, No. 6

Interesting Operations in the Building of Chandler & Price Printing Presses

BY HOWARD CAMPBELL

HE smoothness with which a modern printing press operates ives no hint to the casual onlooker s to the engineering skill and fine orkmanship which has made such nooth operation possible. In such a achine, however, delicacy of design combined with sturdy construction produce a machine that will be caable of adjustments within a tenousandth of an inch, yet also capable f continuous operation for an inefinite period. Such a machine is the Craftsman" Press now being built by he Chandler & Price Company, leveland, Ohio. A few of the intersting operations involved in the pro-



duction of the machine are described herewith.

The Chandler & Price "Craftsman" Press, which is of the Gordon type, is constructed upon a frame consisting of a one-piece solid casting with heavy reinforcing ribs which provide a solid foundation and maintain perfect alignment of the shafts and bearings. The main shaft holes must be machined very accurately and, accordingly, this operation is performed in a Giddings & Lewis horizontal boring mill, shown in Fig. 1. Davis boring heads are used, which are capable of the finest adjustments. The rough boring operation removes the scale and approxi-

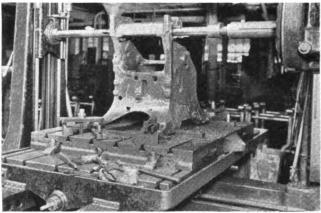


Fig. 1—Boring maishaft holes in Chandler & Price "Craftsman" Automatic Feeding Pres

mately 3/16 in. of stock, leaving 1/32 in. of stock for the finish boring operation. In the finish boring operation, the holes are finished to within 0.003 in. of the specified size.

The illustration Fig. 2 shows the boring and facing operations on two sets of shaft holes in a 12x18-in. bed for a Gordon press. In the immediate foreground can be seen two drills which enter the bearings from the outside. Supplying power to these drill spindles is a very simple matter; supplying power to the cutter heads in the center of the illustration, which face the inside faces of the bearing

holes, is a b more difficult. To facing heads, in dicated by the arrows, a rea tached to a spin dle which is in tegral with worm driven has worm whe

which, in turn, is powered by the universal shaft which extends to the left of the picture. The shaft h an extension joint so that it function properly with the cutter head locate anywhere within the range of the tv bearings. The head containing t spindle carrying the two cutters moved first to one side and then the other in order to mill the fac of both bearings. In this operation the bearing holes are drilled 1-15/32 in. to be later reamed to 1 in., the bearing faces are milled, as the main shaft holes are bored to 35 in. diameter.

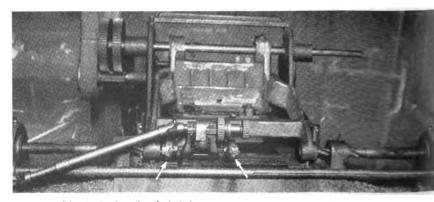


Fig. 2-Boring the shaft holes in the bed for a 12x18-in. Gordon press.

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The boring of the main shaft holes is accomplished by means of an ingenious mechanism. The boring bar, which can be seen in the rear in the photograph, is a 1¾-in. shaft, the end of which is threaded with three square threads per inch. This end of the shaft also contains a longitudinal keyway to which a 75-tooth gear is keyed, the key being a sliding fit in the shaft. Also upon this end of the shaft is located a 72-tooth gear

threaded in the hub with three square threads to the inch to fit the thread on the shaft. These two gears are close together and both mesh with a pinion carrying a pulley to which power is transmitted by a belt.

When power is applied, the 75-tooth gear revolves the shaft and as the 72-tooth gear must also revolve 75 teeth with each complete revolution of the 75-tooth gear, the 72-tooth gear revolves three extra teeth for each revolution of the 75-tooth gear. This

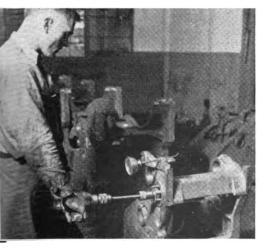


Fig. 3—The main bearing holes are finished to size by honing with this Hutto hone.

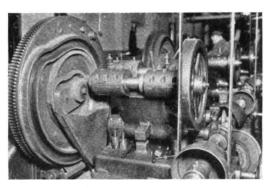


Fig. 4-Milling a cam raceway in a cam.

extra movement of the 72-tooth gear feeds the shaft longitudinally through the hubs of both gears and through the bearings in which it is located, thus providing the necessary feed to bore the bearing holes in the workpiece.

After the frame for the "Craftsman" Press has been completely machined, the bushings are pressed into the main bearing holes. These holes are then reamed with a line reamer, removing some 0.0025 in. of stock and

leaving from 0.005 to 0.006 in. of stock to be removed in the final operation.

The final operation on these bearings is that of honing, which is done with a Hutto hone as shown in Fig. 3. To obtain perfect alignment for the honing operation, the hone is made with a pilot which is a slip fit in a pilot bushing which is slipped into place in one of the bearing holes while the other bearing hole is being honed to size. end of the pilot can be seen projecting from the right side of the casting in the illustration. Power is applied by means of a Black

& Decker electric drill and the 0.005 in. of stock is removed in from 10 to 15 minutes, leaving a mirror-like surface in the bearing.

Figure 4 shows the operation of milling a cam raceway in a large cam wheel which will determine the opening and closing of the press platen.

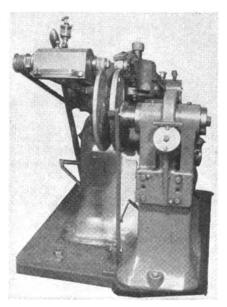


Fig. 5—Cams are finished to size by grinding in this special cam grinding machine.

The operation is being performed in a special cam machine and the finished raceway is accurate within 0.002 in. The stock is being removed with a 1-15/16-in, spiral cutter.

Figure 5 shows the grinding of a chilled cast iron cam, for which operation a special machine is used. The work-piece is bolted to a spindle which also carries a master cam, shown at the right in the illustration. The grinding wheel spindle is carried in a bearing which forms part of a hinged mechanism which also carries a cam roller. When ready to grind the cam,

the cam roller is rested upon the master cam and, as the spindle carrying both the master cam and the work-piece revolves, the cam roller naturally follows the contour of the master cam, forcing the grinding wheel to do likewise. Thus the work-piece is ground to the exact contour of the master cam. The spindle carrying the master cam and the work-piece travels at a speed of 1 r.p.m. and the wheel speed is 13,000 r.p.m. The finished cam must be within 0.015 in. of the size of the master cam and must have a glass-like finish.

The operation shown in Fig. 6 is that of milling the ratchet on the inking disk for a 14½x22½ new series Gordon press. As can be seen, a vertical milling attachment is used carrying a 45-deg. cutter, and the disk is clamped to a circular table which forms part of an attachment that is anchored to the milling machine table. The ratchets must all be cut at the same angle and must be of the same length. Longitudinal table feed is used, the feed being disconnected automatically at the proper place in the cut by the device shown in Fig. 7.

With the feed engaged and the table moving toward the right in the illustration, the finger A pushes the dog B with it and incidentally the shaft carrying the dogs C and D. The dog C pushes the lever E until it reaches the point at which it reverses the table feeding mechanism in the usual manner, causing the table to reverse its direction and feed back toward the left by rapid traverse. As this takes place, the ratchet F, which has caught on the latch G. is held and is thus forced to rotate on the bolt by which it is pinned to the machine, throwing the pawl H into engagement with one of the ratchet teeth on the underside of the circular table. the machine table travels to the left. the pawl H is also forced to swing to the left, forcing the circular table to

rotate until the movement of the machine table is reversed again. This is always, of course, a definite amount. When the machine table has reversed far enough, the lever E is automatically thrown again, reversing the table feed and starting the cut in the new metal which has been presented to the cutter. This device not only saves the operator's time, being completely automatic, but it also insures the accurate machining of the ratchet on the inking disk.

The operator shown in Fig. 8 is straightening crankshafts for Gordon or automatic presses. The machine is an old lathe equipped with a 18-in. diameter hydraulic cylinder supported by a frame work which rides on four wheels on the ways of the lathe. The four vertical corner shafts of the frame extend down be-

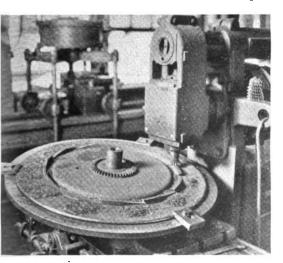


Fig. 6—Milling the ratchet on an inking disk for a Gordon press.

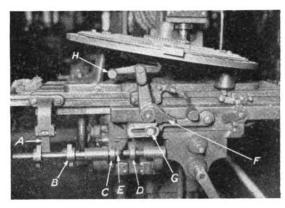


Fig. 7—Device for automatically revolving the work-piece between cuts.

low the lathe bed to receive cross braces under the bed which prevent the frame from lifting when the full power of the air is applied for straightening.

Both the head and tail centers of the lathe are equipped with sockets into which the ends of the rough shaft are placed. With the shaft thus in

position, the operator rotates it by hand until he determines just where the straightening—if any—is needed. After thus locating the high point, supports, one of which is indicated at A, are screwed into position under the ends of the shaft to receive the downward thrust and the straightening proceeds.

Upon the lower end of the piston rod of the air cylinder is threaded a "nose" which can be screwed downward by hand until it rests upon the shaft. With the nose in contact with the shaft, the air valve is opened and pressure is applied to 70

the piston. The 18-in. inside diameter of the cylinder with 80 lbs. pressure of air makes available a total pressure of 1900 lbs. The operator is shown in the act of opening the air valve, which he closes at just the right instant to obtain the desired pressure. Long experience on this job has made it possible for the operator to tell just ex-

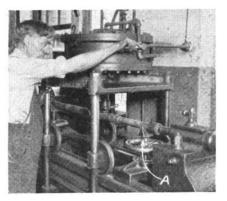


Fig. 8—Straightening rough crankshafts for Gordon printing presses.

actly how much pressure is needed to straighten out a kink in a shaft without bending it more than is necessary. After the air has been applied, the piston is raised by reversing the valve, the supports A are lowered by spinning the hand wheel, and the shaft is again tested for straightness.

The operations described above are a few of many interesting operations in the building of Chandler & Price presses.

Severance Tool Mfg. Co. Catalogue No. 11 and Booklet No. 11A. Two new pieces of literature have been issued by Severance Tool Mfg. Co., 1516 E. Genesee Ave., Saginaw, Michigan. Catalogue No. 11 lists 170 Standard Midget Milling Tools and Booklet No. 11A illustrates many special tools and uses. Copies may be obtained by signing your name on your company letterhead and mailing to the company.

Termed "a bookful of Lathe downs" is the new Golden Annivational Catalog just published by The LeBlond Machine Tool Company, cinnati, Ohio, under the title Makes Main Street". The book was lished to commemorate LeBlond years of service to industry, and is to present an unusual treatment of subject of lathes. While basically tual in its nature, it affords a new original perspective of the Main 8 of production where LeBlond Lave played a conspicuous part.

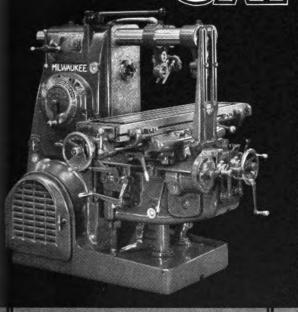
have played a conspicuous part.
The forepart of "What Makes 18
Street" is embellished with four pastels by a noted artist, providing lathe's eye view of the Main Street today's production and civilization, remainder of the book is given over simplified and factual presentation, the complete LeBlond line, written concise and understandable language an endeavor to give a panoramic pied of LeBlond Lathes as the prime mach in industrial service. "What Makes 16 Street" is featured in all current Blond advertising. Copy free to chanical executives upon request.

The Oilgear Bulletin 47000. power pumps and motors made by Oilgear Company, 1323 W. Bruce Milwaukee, Wis., are described in 56-page booklet just published by this company. Oilgear's comprehensive line of modern fluid power pumps and motors establish new standards of size, speed, performance and low cost, through an amazingly simplified mechanism. Standard variable and constant displacement units are available in conventional sizes having normal capacities from 2 to 150 h.p. and peak capacities up to 190 In addition, each size is available with one, two or three units having working pressure ratings of 1100, 1700 and 2500 lbs. per square inch and peak pressure ratings up to 3000 lbs. per square inch.

All variable stroke units are steplessly variable through standard devices, controllable either by hand, electric motor, hydraulic Servo-motor, pilot valve, load and fire mechanism, or pendulum and disc-type precision mechanisms, meeting all normal and many unusual and intricate linear or rotary transmission needs. They are now in use in many plants regarded as very progressive in the press, broaching, machine tool, steel paper, printing, processing and rubber industries. The construction, principle of operation and application of Oligear Fluid Power Pumps and motors are fully described in Bulletin 47000, copy of which will be sent on request.

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MILLING MACHINES





Press Tool Design

In this article the author takes up details of construction and the operating methods of the lancing, bending, and hubbing type of metal stamping die.

BY C. L. SZALANCZY

Tools and Equipment Department, Westinghouse Electric and Manufacturing Company

REQUENTLY in the design and construction of metal stamping dies a number of simple operations are combined into a single tool of the combination type to produce a completed piece of work at one stroke of

outside diameter and has a center hole. There are two 1/8 x 7/32in. lugs pierced and bent over to 90 deg. It also has a hub that is %-in. diameter on the bottom and 3/16-in. diameter at the top. The lancing,

bending and hub forming operations are all performed in the tool at the same time.

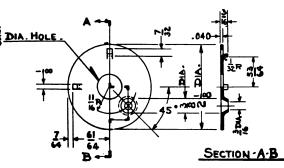
The original blank should be produced by a progressive type of

stamping die that punches out the center hole and the small hole for starting the hubbing operation, and blanks out the piece. Fig. 2 shows the design of the combination die that is used to produce the blank illustrated in Fig. 1.

Part A of the die indicates the punch and die shoes, upon which the tool is assembled. These shoes may be purchased or made round and burned out of hot rolled steel plates, 2 in. thick. The top and bottom surfaces must be slab-ground. The outside of the shoe may be turned smooth on a lathe, although if they were burned out carefully they may be left that way. The shoes must be equipped with guide or leader pins and bush-

ings for aligning the upper and the

lower parts of the die correctly.



MATL. . 040 THICK H.H.SH. BRASS.

Fig. 1-Drawing of the Blank.

he punch press. This type of a tool should not be made when there is nly a small number of pieces to be made, but if there is a sufficient number of such parts in demand to justify the building cost of the tool, a combination die may be designed and constructed to produce it. In this article combination tool that performs hree operations is illustrated and dezibed.

Mgure 1 is a drawing of a blank at is made of 0.040-in. thick half ard sheet brass. The blank is 21/4-in.

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The standard commercial die sets are already equipped with leader pins and bushings. Unless the shop is used to making its own die shoes and has the necessary jigs to set guide pins and bushings quickly and correctly, the commercial die sets will be found the best and also the least costly. Punch shoes may be ordered with or without the punch holder stem. This type of tool requires a holder without the stem. The upper shoe should be not less than 2 in. in thickness.

A 4-in. diameter opening is machined down 1/2 in. deep to accommodate the punch stem B. This stem is turned out of round hot rolled steel stock. The stem part is either 11/2in. or 2-in. diameter, depending on the punch press. There is a 17/32-in. diameter clearance hole down through the center. The 1/2-in. diameter stub steel knocker pin C is guided through the clearance hole. This pin has a shoulder on the lower end and it fits into the hole in the knockout disc D. where it is held fast by peening the pin over on the bottom of the disc D.

The knockout disc D is made from round hot rolled steel, sawed from bar and ground on top and bottom to assure a good setting for the three stub steel knock off pins E. These pins are shouldered and peened over in the same manner as the pin C. Care should be taken that all three pins are of the same length so they all bear alike on the blank when stripping. The knockout disc D moves in an opening under the punch stem This opening is % in. high, which allows about % in. movement.

The die-raising plate, which is made from hot rolled steel and slab-ground on top and bottom is shown at F. This plate is set on the bottom of the upper shoe. A 14-in. deep undercut is provided into which the die G is placed. The die is made of good grade tool steel. The holes for the

punches which pierce the two lugs are filed in, and the hole for the hubbing is profiled in position.

After the center hole and the necessary dowel pin and mounting holes have been finished, the die is pack hardened to 85—90 scleroscope. The hubbing hole has a small radius where it comes in contact with the blank material to prevent it from shearing off. The same condition exists at the back or the bending end of the two lug-piercing holes. The die is tapered off at an angle on the outside, both as a safety feature and to facilitate loading and unloading the tool.

Two 5/16-in. dowels align the die. raising plate and the upper shoe, while three %-16 fillister head screws hold the entire upper die assembly together permanently. The lower die shoe is recessed %-in. deep to admit the punch holder plate H, which locates and holds the three punches in place. It is made of hot rolled steel, turned on the outside and slab-ground on top and bottom.

The plate has three clearance holes drilled clear through it into which the stripper springs I are placed springs are a commercial product (%-in. outside diameter), and are provided to allow free movement to the special socket head stripper screws that pass through them. The stripper screws are marked J in the illustration. It is called to the readers attention that the body of the screw is larger than the screw end Thus, when the screw is tightened against the stripper, it locks itself and cannot work loose when the die is in operation.

The stripper K is made of hot rolled steel, slab-ground on the top and bottom. The holes which the three punches and the center or locating pin go through are made to a sliding fit. Three 5/16-in. 18-thresholes are drilled and tapped in correct

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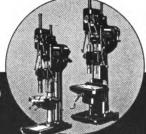
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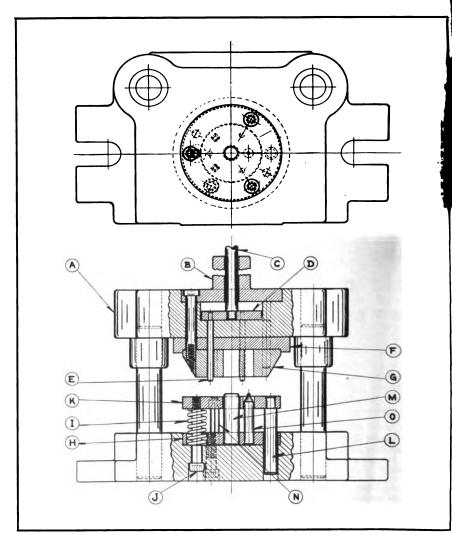


Fig. 2—Drawing showing Design of Combination Lancing, Bending and Hubbing Die that Produces the Blank Illustrated in Fig. 1.

position for the stripper screws. Three ½-in. diameter stub steel pins L are turned down to %-in. diameter at one end and are hardened to 40-45 scleroscope on the large end. The small end is inserted into the stripper and

is peened over. The top surface where the peening was done is then ground smooth so that it will not mark the blank when pressure is applied.

These pins have two definite duties to perform. First, they take some of



the strain off the punches by acting as guide pins, and then, the final setting of the hub is done directly on the pins when they come to rest on top of the bolster plate that has been anchored to the punch press table.

The locating pin M is made from stub steel. The upper end is finished

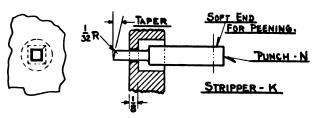


Fig. 3-Lance and Bending Punch and a section of the stripper.

0.003 in. smaller than the %-in. center hole in the blank, and has a taper to facilitate the locating of the blank. The pin should be hardened to resist wear. The pin M is press fitted into the punch holder plate. The punch plate H is fastened to the lower die shoe with three fillister head screws and two ¼-in. dowels keep it from moving out of alignment with the upper assembly of the die.

The two punches N that perform the lug-piercing and bending operations are made from tool steel, and are ground to a press fit size to suit the opening made for them in the punch holder plate H. Note that the working end of the punch is made short and stubby so as to reduce the breakage hazard. The punches are hardened to 68-73 scleroscope and the end that fits into the punch plate is drawn back to about 35-40 scleroscope so that it may be peened over to prevent the punches from pulling out when stripping the formed blank.

Another feature of this soft end on the punch is that it acts as a cushion and impedes the punch from working itself into the punch shoe, which would happen in time if it were left hard. In Fig. 3 the punch is shown as it passes through the stripper. The stripper is bored out to leave only ½ in. at the top for guiding the punch. If it were not made in this manner, the punches would be too frail and would fracture and break. This view also shows how the punch is ground

back at an angle on the top with a small radius on the noncutting end to prevent the blank material from being sheared off.

The hubbing punch O, Fig. 4, is of stab steel and has the required angle turned and ground

on the upper end to form the hub in the blank. The small round lead should be about ½ in. long and radiused on the top to aid in locating the blank. This punch is hardened in the same manner as the previously described punches N.

When the die is in operation and the press ram is up in open position, the stripper K is 1/3 in. down from

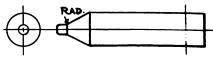


Fig. 4-Hubbing Punch O.

the top of the locating pin and the hubbing punch. The blank material is placed into position over the locating pin and hubbing punch. As the press ram carrying the upper die structure comes down, the knockoff pins engage the blank material first.

By this time the hubbing punch has started to form the hub and the blank material is held between the stripper and the die. The lancing punches come in contact and cut the three sides and as the press ram continues

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downward, the lugs are bent upward and are finally set to 90 deg. as the press reaches the bottom of its stroke with the stripper pins L resting on the bolster plate.

On the up-stroke of the press, the springs force the stripper upward. The blank will naturally stick in the upper part of the die and will remain there until the knockoff pins eject it back onto the stripper. The loading and unloading should be done with special tweezers that are supplied to the press operator to eliminate accidental injuries to the fingers.

Landis Threading Equipment. The purpose of this 16-page bulletin is to present Landis equipment suitable for the requirements for thread cutting in railroad shops and in those associated metal working industries whose products are essential to the safe and efficient maintenance of the rolling stock of railroads throughout the world. Equipment described and illustrated included Landis Chasers, Landmaco Threading Machines, Landis 1½-In. Reverse Taper Die Heads for threading tapered head crown bolts, timing attachments, work stops, Type F Landmatic Heads 32 AX Landmatic Heads, Lanco Heads, "Little Landis" Pipe Threading and Cutting Machines, Landis 4, 6 and 8-In. Pipe Threading and Cutting Machines, and Landis 34 and 1-In. Automatic Forming and Threading Machines.

Copy free by addressing Landis Machine Company, Waynesboro, Pennsylvania.

Manual of Gear Design—Section 3. By Earle Buckingham. 172 pages, 8½ by 11 inches. Published by The Industrial Press, 148 Lafayette St., New York. Price, \$2.50.

Section 3 of the "Manual of Gear Design" contains the formulas and tables required in solving all kinds of helical and spiral gear problems. The term "helical gears" has been applied to parallel-shaft drives, and the term "spiral gears" (in accordance with common usage) to non-parallel non-intersecting shafts.

Section 3 conforms in size and general appearance with the previously issued Sections 1 and 2, Section 1 consisting of mathematical tables for general use in gear design, and Section 2, of formulas and tables for designing spur

and internal spur gears.

Section 3, like Section 2, begins wit definitions of various gear terms agives the symbols or notation used the formulas throughout the book. formulas are accompanied by example showing their practical application application of the symbol of the symbol of the symbol of gears and pinions or by giving direction gears and pinions or by giving dat representing partial solutions to mankinds of gear problems.

This book not only deals thorough; with the design of helical and spira gears, but includes considerable information and data about the cutting of such gears by hobbing, shaping, an milling. Even change-gear calculation is included, as required in connection with

or without a differential mechanism. The designer who needs at times, is addition to the ordinary standard formulas, special formulas and data with the special formulas and special formulas and special formulas and special formulas and special gears.—Section 3 covers these and many other important elements of helical and spiral gear design, including, of course, herringbone gears.

Information on the standard took forms adapted to milled, hobbed, and shaped helical gearing is given, with formulas and examples showing practical application in all cases. The graphical method of determining end thrust and bearing loads is illustrated, and the section on spiral gears features a simple graphical method of especial value when the mathematical solution is indeterminate or must be solved by trial. The sections on power-transmitting capacity deal not only with dynamic loads and beam strength, but also with loads as limited by wear.

This book is restricted entirely to working information and data, and a complete index enables the user to locate readily any formula or tabulated data required. This latest addition to the "Manual of Gear Design," like its two predecessors, is approved by the American Gear Manufacturers' Association. It represents the accomplishment of a man whose national reputation as a gear-designing expert is based upon the results he has achieved in analyzing and solving many different classes of gear-designing problems.

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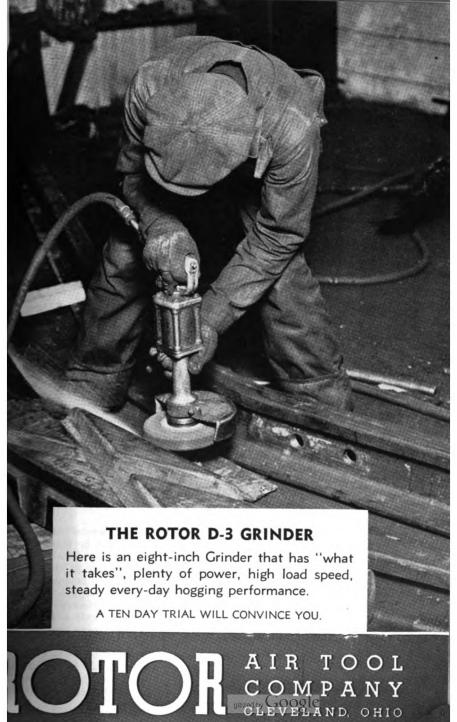
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Safety in Crane and Elevator Operation

By R. A. SHAW

Safety Engineer, Murray Corporation of America, Detroit, Michigan

I N MANY plants of the type represented by The Murray Corporation of America, our modern highlyorganized progressive system of manufacturing is dependent to a large degree upon the efficient functioning of the cranes and elevators involved. It seems strange, therefore, that the equipment referred to is the least understood by the average foreman or superintendent. The fact is, however, that the maintenance of such equipment is usually delegated to some The superintendent or master mechanic may be thoroughly familiar with all other necessary tools, machines, and conveyors, but he is satisfied to let others worry about the cranes and elevators.

Inasmuch as the efficient operation of the plant so often is dependent upon such equipment, it would seem imperative that every machine shop executive be familiar with the mechanical details, operation, and care these items. Considering heavy tasks that often are imposed upon them, the cranes and elevators comprise a constant potential threat to production schedules. The average machine shop executive has usually served his apprenticeship at machines of the type under his supervision, but only in rare instances has Cranes and elevators, by their very nature, are constant potential sources of danger. Proper regulations will reduce casualties to the minimum.

he ever served any time on overhead cranes or elevators. Occasionally, therefore, he receives a jolt which focuses his immediate attention upon this equipment.

Modern cranes and elevators are designed with an eye to safety as well as efficiency, and mechanical safeguards of various types are employed Such mechanisms need checking at regular intervals to insure proper adjustment. However, in spite of all precautions accidents will occur in and about such cranes and elevators. and the sad part of it is that these accidents are usually of a severe nature. In many cases the equipment can be blamed, but the human element must always be taken into consideration.

Of those cases where it appears that the equipment can be blamed, 90 per cent are traceable to lack of proper inspection or failure to check the operation of the equipment at regular intervals. The old slogan "A tap saves time" is certainly true. The railway traveler feels a sense of security when he hears the tap-tap of the inspector as he taps the wheels with a hammer to make sure that they are sound. It is impossible to test cables by this method, but there are other and just as efficient methods

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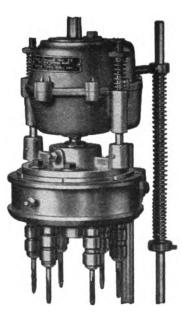
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BROOKLYN, N. Y.

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KEEP OUT FROM UNDER LOADS

Safety Posters help to impress the necessity of safety on the minds of employees.

which can be used to discover when a change of cable is necessary. However, regardless of the supposed safety of crane cables, the first rule in a shop where an overhead crane is used should be that all employees must keep out from under crane loads.

When a cable on an elevator breaks,

the elevator starts to fall with constantly-increasing momentum and at a given speed a safety dog is thrown out which engages an auxiliary "safety" cable. If the dog and safety cable have been inspected regularly and are in good condition, the elevator will be stopped within six fect



The whole point of issue is whether or not the plant executives have recognized the importance of having this inspection made at regular intervals.

In too many cases the importance of special training for crane and elevator operation is under-estimated, and the idea prevails that one as little skilled as the shop "handy man" can

AUGUST 1. 1934

ELEVATOR OPERATORS' INSTRUCTIONS

STUDY CAREFULLY AND KNOW **EACH. RULE**

SIGN PERMIT AND CARRY AT ALL TIMES



THE MURRAY CORPORATION OF AMERICA

> INDUSTRIAL RELATIONS Department of Safety

Front cover of Elevator Operators' Instruc-tion Book. This book is 3x4½ inches in size; small enough to be carried in the pocket at all times. The inside back cover is the operator's permit.

operate such equipment-at least in And too often such an emergency. judgment has resulted in a bad accident, if not death.

The importance with which safe and efficient crane and elevator operation is regarded by The Murray Corporation of America is indicated by the fact that no one is allowed to op erate such equipment without firs having obtained a permit signed by both the Plant Engineer and the Plan Safety Engineer. The permit occupie one page of a book of rules with which the prospective operator mus familiarize himself before he can ob tain the permit. The rules for cran operation are given herewith:

1. ALL LEVERS are to be in mentral pos tion when power is off.

2. UNSAFE CONDITIONS, both on the fee and on the crane must be reported in mediately to the foreman or to the Safet

3. OVERLOADING OF CRANES in prehibited. Check all questionable loads before 4. BRIDGE FOOT BRAKES must be cheshe

at the start of each shift.
5. APPLY FOOT BRAKES gradually. Excessive strains on crane parts will be

avoided in this manner. 6. CRANE GUARDS must be in place; espe

cially sweep guards on wheels.

7. BUMPERS on both trelley and main girds track should not be bumped hard. Keep

Crane Speed under control at all times. 8. SIGNALS FOR LIFTING must be taken from the hooker, except in the power pres department where the press centrel oper ator will signal. Abide by signal code

on Page 4.
9. HOOKING must be done safely. The crane operator is equally responsible for

crane operator is equally responsible to hazards when lifting.

10. SAPETY OF MEN on the floor is the crane operator's responsibility as well at the hooker's. Keep workmen away free loads in motion. Report all violators.

11. STEEL BUNDLES must be securely bound.

before lifting

12. CABLE ANCHOR CLAMPS must not be put under strain at any time. Keep enough cable en drum, when required, to make life from below floor level.

13. TOOLS and other materials must be per into the tool bex and not left lying less on the crane.

14. PULL MAIN SWITCH when leaving crass

for any reason.

15. GOGGLES must be worn when testing ex removing fuses. Be prepared for a fash.

16. CRANE HORN must be used to warn workmen on the floor of approaching leads.
Hooker must precede the lead.

17. TRACK WALKERS will be dismissed. Use

the landings when getting off or on crame.

18. CLAMP BUMPERS must be placed between live crane and workmen on track and between live crane and crane used by werkmen.

MAINTENANCE.

DO NOT PUSH other cranes, except in the presence of the foreman or inspector.
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motor is prohibited. Use foot brake to

- slow up or stop. 21. BURNED CONTACTS are avoidable. Excessive amount of maintenance due to burned contacts will result in disciplining
- of crane operator.

 22. DRAGGING OF CHAINS is prohibited.
 Keep a constant watch for chain defects.

 23. LOCK MAIN SWITCH when making re-
- pairs, oiling, or inspecting.

EMERGENCY.

- 24. LIMIT SWITCH on the hoist is for emergency only.
- 25. Operating Hand must remain on the hoisting lever while lift hoist is in motion.

CLEANLINESS.

- 26. DIRTY CRANES will not be tolerated.

 Operators are held responsible for condition at all times.
- 27. SPITTING ON FLOOR of cab or over rail will result in disciplining of operator.

the fact that it can happen was demonstrated recently in a near-by steel mill.

The crane hooker had completed hooking the tail chain to a ladle of molten slag suspended from the crane hook, and had stepped away to a distance of perhaps 30 feet when the ladle dropped. The hooker suffered multiple third degree burns on both legs, his back, and his right arm & he strove frantically to get away.

Sadly enough, the accident was that it was not his fault. The ladle had dropped because of the breaking of

a 414-inch shaft in the hoisting mechanism. Had an inspection been made at regular intervals, it is likely that the defect in the shaft would have been discovered.

To insure, as far as possible. the safety of all cranes, the cranes are inspected at regular intervals which are determined by the

amount of service to which the cranes are subjected. Inspectors are required to check the condition of cables, foot walks, toe boards, and the capability of the operator. The operator is required to show his permit and to answer any questions regarding his manner of operating the crane that the inspector may ask.

When the crane must be withdrawn from service in order to make inspections or repairs, a report on the inspection and the work done must be made by the inspector to the maintenance superintendent.

Elevators are also inspected reg-

CRANE OPERATORS PERMIT

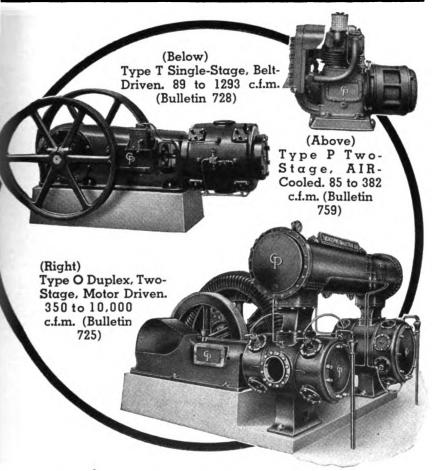
Name	
Date	Badge No
This is authority for the above in the plants of The Murray Comit must be carried at all times are to follow these rules.	named person to operate a crane reporation of America. This per- while operating crane. Hookers
Plant Engineer	Safety Engineer

Crane Operator's Permit. Size, 3 x 41/2 inches. No one is allowed to operate an elevator without first obtaining a permit.

Note particularly rule No. 23. How many bad accidents have occurred because the main switch wasn't locked while the crane operator was oiling or inspecting the mechanism, perhaps creating the impression that there was no one on duty? Rule No. 17 is important to maintenance and construction men.

It is important that the crane mechanism be inspected at regular Cranes are built for strength, and everyone, from the top executive down, is too often prone to take it for granted that nothing serious can happen to a crane. However,

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Plant #	Bldg #	Elevator 4
Operator	Bldg. ∮ Permit	CleanYes
PENT HOUSE	Engine Fastenings Bearings Automa W. Gear Other Gears Slack Worms Brake Keys Thrusts Drum Cushions Vibrator Sheave Motor Alignment Brushes Bearings	Grease cups Hazards
	Controller Reverse Line Automatic and Circuit Br'kr Wiring Res Switches Insulation Floor Stop	Magnets Contacts
CAGE	Car Floor Crosshead Cab Wainscote Guide Shoe Liners Car Gates Cate Sw Electric Lock Slack Cable Screening	vitches Push Buttons
HATCHWAY AND ACCESSORIES	Guides Guide Fastenings Counterweight Buffers Equalizers Limits and wiring Locks Doors Door Hangers Enclosure operators Center Pull Cond. Cables	Door Switches Gates Gate Fastenings
GOVERNOR, SAFETY EMER- GETCY, AND CABLES	Covernor Governor Cable Weight Swit	nCarCwt
SIGNALS AND LIGHT	Annunciator Threshold Light Flash Lig Annunciator Wiring Other Wiring Machi	cht_ Car Light_ Ine Light Push Buttons_
CAR	Car SwitchesTiller and Lock Crank	
GATES	Gate Gate Ropes Operator Devices	Hangers Enclosure-
HATCH AND O.H. WORK	Beams Sheaves Shafts Bearings Fast Penthouse Machine Room Clean	Spring Bumpers
DID YOU TEST	Hatch Limits Circuit Breaker Slack Automatic Governor Yes No Ladders Landings Stairways	CableSafety
PENTHOUSE APPROACHES	Ladders Landings Stairways	
f.	Mr. heck after each item found in condition you actory operation. If not in good order, me sport fully on the back. Make a separate 1 See other side.)	ark X after each item and

Check Sheet used by elevator inspectors. Size, 81/2 x 11 inches.

ularly and their condition reported by the inspectors. To insure that no item is overlooked, the inspector is required to check off each detail of the mechanism as listed on the sheet shown here. He checks each item as he examines the mechanism and any parts are found in need of attention, he reports fully on the back of the sheet.

Emergency safety dogs on elevator have been found stuck due to paint



LPING GOOD MECHANICS DO BETTER WORK

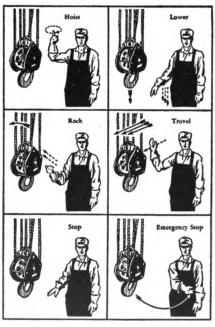


Black & Decker

The drum shaft may stick due to rust, creating a 100 per cent unworkable condition of an otherwise efficient emergency device. When this occurs, it can be traced directly to lack of proper inspections.

The worm drive is seldom checked, and demands removal of the thick

SIGNALS TO CRANEMEN



gear oil before inspection. Inspection twice a year where the elevator is used more or less continuously is usually sufficient.

Elevators operating without door or gate contacts are a demonstration of extreme neglect on the part of the management. Such violations are usually traceable to some over-busy foreman who is willing to run the chance rather than hold up the use of such equipment until necessary repairs are finished. Compromising with safety is poor practice.

Elevators, especially of the free type which are used to carry ployees, should have a white painted on the vertical sides two back from the front gate. The dator should refuse to operate the vator unless all persons on the elevator are behind this safety sine is Constant attention of the operate regard to this matter should be quired.

The best place for stretchers in large and busy plant is on the sof the elevators, except those of passenger type. When stretchers needed, all employees will remet that they have seen the stretcher the elevators.

Each elevator operator is required to know every one of the 33 rule the book of Elevator Operators' structions, and must have a signed permit before he is allowe operate an elevator. The rules as follows:

 Emergency call, one long and three rings. This call is to be used for fir accidents only. Report anyone abusing call.

Never carry passengers when games being carried on the car.

3. The stretcher must not be removed the elevator permanently. See that it turned to the hanger-ready for future 4. Before loading machinery, consult foreman. Be sure weight of load with capacity of elevator. Never out

SAFETY ESSENTIALS.

5. Before closing elevator deers se

everything is clear.

6. Never start your elevator until all sengers are back of the damger line.

white line must be repainted regularly. Do not remove hand from lever or while elevator is running. Keep has lever so that elevator can be stopped

stantly in case of accident.

8. Horse-play will not be telerated.

9. On passenger elevators, be ser

doors are closed before operating.

10. Never load or unlead elevators equivith hand rope control locks unless to

in neutral position.

11. Employes will not operate elevators to out a permit. All violations are is reported.

12. Never pull a truck toward you; pad

Never pull a truck toward you; pull
This will eliminate accidents due to vi
of trucks.

Lock switch when steam fitters or employees are in elevator-pit.



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Ryerson has always carried only the higher

quality steels. Now, after years of planning, they bring you Certified Steels—steels of known quality—with year after year uniformity. Special quality and service features help users secure best results. For instance, alloy bars are of selected chemical analysis. They are tested for heat treatment response. Complete data on every bar is sent the customer to guide in treating the steel. We believe you will be interested. Write for book. let G-8 which tells the complete story. Joseph T. Ryerson & Son, Inc. Plants at: Chicago ... Boston ... Milwaukee ... St. Louis ... Cincinnati Cleveland ... Buffalo ... Philadelphia ... Detroit



... Jersey City.

14. Pull main switch when general repairs are te be made and see that same is locked open.

MAINTENANCE.

- 15. Do not operate elevator when gate contact is out of order. Call Maintenance Department at once. Elevators must not be operated when gates are up.
- 16. Never overload elevator. Check capacity figures on all trucks and estimate loads. YOU are responsible for accidents due to overloading.
- Elevator screen must always be in place over top and properly adjusted.
 Under no condition must elevator be
- operated if gates or fire doors are opening at floors other than where elevator is stopping. Stop elevator at opened space stopping. Stop elevator at opened space and call for immediate repair from Maintenance Department.
- Mechanical defect or need of brake adjustment is sufficient cause for stopping elevator for repairs.
- 20. Indifferent operators will be replaced with others of more courteous and agreeable
- 21. Never leave elevator at top floor when not busy; return it to main floor. In case of fire, time will be saved.

CLEANLINESS

- 22. Always keep car clean and painted.
- 23. Keep floor of elevator clean from grease and dirt.
- 24. Do not litter sides of elevator with clothing and other materials. Keep elevator neat

Columbia JFS-Jr. Varia-Speed Control Bulletin. The construction features and operation of the JFS-Jr. Vari-Speed Control, formerly known as the Hi-Eff. are described and illustrated in a fourpage bulletin now being issued by the Columbia Vari-Speed Co., Liberty Bldg., Wheaton, Ill. Selection table for the Var:-Speed Control is included. Copy free.

Moraine Handbook of Durex Bearings, published by Moraine Products Division, General Motors Corporation, Dayton, Ohio, tells the story of a special bronze bearing metal, developed in the General Motors Research Laboratories, which has the ability to absorb lubricating oil and to feed it to the contacting surface so as to maintain a protective oil film be-tween the journal and its bearing at all times under load. Durex Bearings are made of powered metals, briquetted, heat treated and oil impregnated. The thus has a porous structure through which oil, applied to the wall of the bearing, is conveyed to the bearing surface. In many cases the original impregnation of oil, which all Durex Bearings receive, is sufficient for bearing lubrication for the life of the machine of which the bearing is a part.

- 25. Procure clean everalls each week. SAFETY.
- Never visit while elevator is traveling.
 If necessary to obtain information, step elevator while doing se.
- 27. Check each end of elevator before starting to see that loads will clear gates or end
- 28. Safety Type Shoes will protect your feet from trucks or falling material. They are sold at the Employees Store.
- 29. Do not argue with fellow workmen. port violators to your foreman.
- 30. Hollering or throwing anything to attract attention of employees is prohibited.
 31. Loads are to be distributed as much as
- possible in middle of elevator. 32. No one is allowed to lean against or over
- elevator gates. Report violators.

 38. Special attention is necessary when repairmen or insurance inspectors are in-specting the elevator for defects. Leck switch when they are under elevator or when repairs are being made. Follow their instructions.

Accidents on equipment of this nature will be reduced to the minimum if everyone, including the plant executives, lives up to the Safety Rules. No one other than the approved operator should be allowed to operate an elevator or crane without having first procured the required permit.

The control of oil flow through the Durex Bearing wall is dependent upon several factors, among which are (1) density of the bearing metal, (2) porosity of the material, (3) viscosity of oil, (4) temperature, (5) pressure of oil at source, and (6) condition of inner and outer wall surface. These various factors are discussed in detail, the loadcarrying ability per square inch of projected bearing area being illustrated by means of a chart. The book is pro-fusely illustrated with cross-section drawings showing typical installations of Durex Bearings and showing the various methods of application. The text is divided into chapters as follows: Durex Properties. Structure and Oil Through Durex Bearings, Load Carrying Ability, Durex Bearings in Machine Design, Typical Installations, Installing Durex Bearings, Press Fits and Clearances, Durex Bearings in Die Castings. Durex Bearings: Sizes, Straight Cylin-drical Bearings, Standard Flanged Bearings, Self-Lining Bearings, Thrust Washers, and Irregular Shapes. The book contains 40 pages in color, bound between attractive imitation hammered copper board covers.

Copies free to plant mechanical executives.

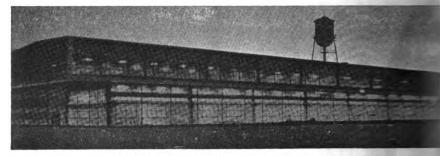
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SELF A FAVOR?

operations the machine will efficiently perform in the tool room. Hob grinding, circular forming tool grinding, staggered tooth gear cutter grinding, internal grinding, surface grinding, radial grinding, cutter and reamer grinding, and so on and so on. Nor have we the space to explain the features of design and why they make the 12" x 28" so popular with operators ● Do yourself the favor of learning these things by sending for the catalog. Ask for No. K-137. We've made it easy—simply fill in and mail the coupon below. You'll be as enthusiastic about the Landis 12" x 28" as we are, after you've seen it saving valuable minutes in your own tool room.

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Night View of New Addition to Monarch Machine Tool Company's Plant

Modern Standards for Machine Shop Lighting

BY BARTLETT WEST

LTHOUGH machine shops were among the first groups to recognize the importance of good lighting as an aid to precision work and the well-being of employees, there is still plenty of confusion as to just what "good lighting" means, as applied to a particular shop and a particular set of operating conditions.

The first cause of this confusion, perhaps, is a tendency to think of light in terms of quantity alone. "Have you enough light?" is treated as the only important problem, to be solved by screwing in bigger bulbs. Frequently, if the plant superintendent or maintenance man acquires one of the small foot-candle meters which show desirable levels for different seeing tasks, he becomes a virtual "light dictator" overnight—and woe betide the man who still complains of poor light should the meter read 20 foot-candles or more!

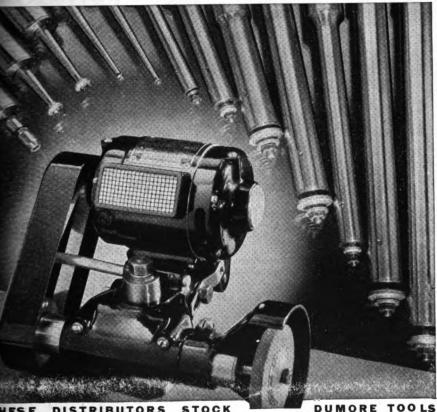
Lighting engineers who have worked in plant after plant to meet the needs of each particular set-up are frank to admit that the problem is not so simple. Even windows which

flood a room with natural daylight may produce poor seeing condition for certain operations. Sometimes rearrangement of equipment or a relocating of lighting units can do more to benefit good seeing than any increase in the quantity of light. More often, a well-balanced attack on the problem, considering the quantity quality and distribution of light best for each type of seeing task, is the only sound procedure.

At a work bench or machine directly adjacent to a large winds. bright daylight may furnish an illumination level as high as 300 footcandles on the work. Under clean saw-tooth skylights, the level usually ranges from 30 to 100 foot-candles on bright days at different points across the room. It is the exceptional plant, of course, where these levels exist more than a few hours a day for three or four days a week. Nevertheless, the extra comfort and efficiency made possible when this high level of daylight illumination does exist give a measure of the value of good seeing, both night and day.

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Fig. 1-At the Ladish Drep Pe Company, Cudahy, Wis., illumination is provided by Hewitt lamps at a height of 18 In addition, directly machine, other lamps are mous on swinging arms, revealing detail, yet easily swang out of way when die blacks way when die blocks are delive by the crame.

If we accept setting of a lathe tool or reading a micrometer as a typical seeing task in the shop, 20 to 30 footcandles on the working plane is certainly a conservative minimum, based on widely recognized visibility tests. Actually, no rigid minimum can be established. Drill presses, for example, may call for the most critical

seeing down with-

in the holes. Internal grinders and boring ma-

chines may require that t light penetrate horizontal to a depth of several inch Punch presses, turret lathe gear cutters and the li generally have overhanging parts which block off a lar proportion of the light fro

the points where critical seeing is r quired. Under these conditions, ge eral illumination levels of 50 foo candles or more are now being adopted, so that even deep recess are raised to a detail-revealing leve whatever it may be under the circur stances.

Originally, in shops set up for

Fig. 2.—In this large machine department of the Gleason Ma-chine Works, Rochester, N. Y., every inch of floor space is made equally useful through the uniform high levels of illumination provided "skylight" unitworkman is never in his own shadow; he can see details easily, works without eye-fatigue throughout the entire shift.



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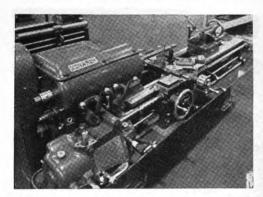


Fig. 3—No floodlights—only the regular shop lighting was used for this photograph at the Monarch Machine Tool Company, Sidney, Ohio. For precision operations here, the illumination level is some 80 foot-candles on the horizontal plane, furnished by high-efficiency mercury lamps.

single-shift operation, artificial lighting was regarded primarily as a means of supplementing the available daylight at vital points. As a result, drop lamps and bracket lamps mounted close to the work frequently became primary light sources for night operation, in spite of their seri-

ous limitations in proper lightistic distribution. Even today, dro lamps and bracket lamps have their place, but not as a mean of "saving" on general lightis—as plants who have thoroughly checked their overall coshave discovered.

When a bracket lamp mounted over the cutting to on a lathe, or some corresponding location, the illuminated directly on the work may be foot-candles or more—appared by fully adequate for the follower, the brilliance of the small well-lighted area muconstitute a serious safe hazard to the operator if the rest of the shop has only a ferror of the safe has only a fer

scattered overhead bulbs. Once turns his eyes from the work, the re of the shop will necessarily seem semi-darkness. A minute or mo may elapse before he can really swell enough to find a wrench or wiping cloth, or to walk safely down the dimly-lit aisle.



Fig. 4—This section of the welding division in the central overhaul and repair base of the United Air Lines is illuminated by Cooper-Hewitt lamps. High illumination levels of detain revealing light are one more step in assuring "happy landings".

FORE



AFTER

' FIFTY

CENTS



POR twenty-five years the National Tool Salvage Company has been transforming fifty cent pieces into dollar bills. Literally, of course, that isn't possible. But here's just one typical example of how efficient reclaiming methods offer you "two for one" cutting tool service and economy:

The "before" illustration at the left shows a 1" taper shank reamer which originally cost \$4.40. The 15/16" recut tool to the right, when new, cost \$4.00. Reclaiming by the N. T. S. method costs only \$2.00. The actual saving is \$2.00—or 50%.

Other savings made possible by reconditioning your worn or broken cutting tools run as high as 60%...never less than 20%. Every tool is ground to its original accuracy without destroying the temper. It is always guaranteed to give you new tool service.

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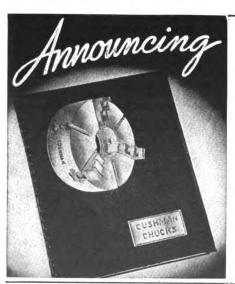
OOL SALVAGE IS TOOL ECONOMY

In addition, small, concentrated light sources of this type invariably cause reflected glare from bright metal parts. Frequent readjustment of the lamps to avoid shadows is irritating and time wasting. ance costs for cleaning and for replacing damaged bulbs, sockets and leads are always high. Today most production machine tools, particularly those of the automatic or semi-automatic type, do not require any greater visual concentration on the work than they do on gages, adjusting levers. and other controls. These controls are frequently located at the sides or ends of the machine, well out of range of any small drop lamp. They require a uniformly distributed light, adequate in the vertical plane as well as the horizontal, and as free from shadows as possible.

It is safe to say that there is now no common seeing task in production

or inspection—from die sinking machine-tool assembly-which can be performed to advantage by prop ly engineered general overhead il mination, entirely without drop lan or bracket lamps. The few born operations and tool room jobs which a local lamp is desirable a those which require the same supp mentary light source even in t brightest daylight. Indeed, the pro ent ideal in plant light is to make throughout the shop the seeing co ditions which exist directly below large skylight on a bright day.

One important characteristic such "sky-light" lighting, natural artificial, is the low intrinsic brightness (or brightness per unit area) the light source itself. Except in trare instances where reflected glin and glare are desirable, such as lighting jewelry store windows, a light source of large area in proportion



A NEW CUSHMAN CATALOG

No. 50-1937

In addition to description and price listings of the unusually complete Cushman Line of Precision-built Chucks, this new catalog gives for the first time a full listing of chucks adapted to the New American Standard Types A-1 and D-1 and to the Long Taper Key Drive Spindle Noses. Several important new chucks are included, together with progressive improvements in design of standard types.

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nged to suit the need.

Acme Machine Co., Fresno, Calif., has found that Metallizing increases profits and builds business. Photo shows crankshaft of White truck being Metallized with high carbon steel. Connecting rod journals have already been built up, center main bearing is in the process and front and rear main bearings have been roughened to receive the deposits from the Metallizing gun.

Hundreds of alert contract shops are bringing in extra profits and establishing their shop as the most progressive . . . by installing Metallizing equipment.

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its output has several distinct advantages. Shadows are soft and diffused. With normal mounting arrangements, more light is available on vertical planes. Both direct and reflected glare are reduced to a minimum.

In practice, several alternatives have been adopted to secure a large area light source. Totally indirect lighting is one solution, but it is seldom practical or efficient in the machine shop, as it calls for flat ceilings unbroken by shafting, and kept

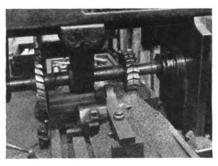


Fig. 5—This machine picture taken at the Monarch Machine Tool Company demonstrates the high detail-revealing quality of mercury light. Even the tiny metal pieces shown are readily seen under this shadow-free light.

immaculately white. Special reflectors of one kind or another with diffusing glass over the lamp bulb are quite common, applied either to incandescent lamps or the newer bulbtype mercury vapor lamps. Their principal limitation is the fact that considerable efficiency is lost in adequate diffusion of the light, particularly where a high light level is desirable and the larger bulbs must be used.

For work on sheet metals, bright metal parts and other applications requiring a minimum of glare at high illumination levels, long-tube mercury vapor lamps of the Cooper Hewitt type have been widely adopted. As this type of light unit is inherently low in unit brightness, it fursipractically glareless light without need for light-absorbing glass. In the control of shadown "engineered" distribution of light machine tools, the 50-in. longitudity, as the lamp may be set up parallel or perpendicular to the chine, distributing the light curing a machine shaft, into recein front of and behind a characteristic or as desired.

The Aluminum Company of A uses this method of lighting spection of aluminum sheets bright-finished aluminum Cooper Hewitt tubes are used in the steel industry for tir inspection. At the Cheyenne b the United Air Lines, inspect regularly made of Alclad she aluminum alloys. Under incandescent light, the bright num finish is very difficult to Thus they on or inspect. adopted the long-tube mercury lighting to obtain a long light which is both glareless and details vealing. For fine machine work as propellor grinding, 50-in. merce vapor tubes, mounted on 8-ft. cente are used. A 10-ft. spacing is used the engine overhaul and assemi shop, and in the sheet metal at shops, these lamps ar welding mounted on 12-ft. centers, about 1 ft. high. For general machine work lighting engineers recommend spacin of these lamps on 10x10, 10x12 o 12x12 foot centers, depending apo the seeing tasks involved.

Recent developments have been made in the Cooper Hewitt lamp which are of note. The new lamp operate in a horizontal position, rather than at the slight angle formerly required for operation. A new principle of starting makes it possible for these lamps to start the instant the current is turned on. Finally, they



110



Fig. 6—High bay lighting with the bulb-type mercury lamp affords good general illumination reducing shadows to a minimum. Note the uniformity of illumination throughout the plant and the bright, sunny atmosphere created by this lighting.

operate at greater efficiency, producing 28 per cent more light per watt than formerly.

One machine operation which requires extremely high standards of precision and, therefore, good seeing, is that of die sinking. At the Ladish Drop Forge Company, Cudahy, Wis., well-known makers of forgings, a "double-decked" arrangement of Cooper Hewitt lamps has recently replaced older lighting units for this task. General illumination is provided by a row of these lamps at a heighth of 18 ft. In addition, other lamps are mounted directly above each machine on swinging arms, revealing fine details. When die blocks are delivered by the crane, the lamps are easily swung out of the way.

In plants where every effort is made to maintain natural, pleasant surroundings, the "sky-light" unit has sometimes been preferred to the use of straight Cooper Hewitt tubes. This "sky-light" unit comprises a Cooper Hewitt mercury vapor tube in combination with incandescent lamps above an angular channel of diffusing glass. This method blends the bluegreen color characteristics of the mercury vapor light source with the yellow-red characteristics of incandescent lamps. The resultant light source provides a high illumination level with pleasing daylight effect. With the modern trend toward better working conditions for employees, this "synthetic daylight" illumination has been widely adopted.

The Warren Telechron Company at Ashland, Mass., has made use of these new "skylight" units in its recently expanded factory. This company manufactures electric clocks and special devices for synchronizing generating systems and equipment controls, in which work many small parts are assembled. In addition, die making and machining operations require



---the new improved type of File with teeth that cut like a metal saw.

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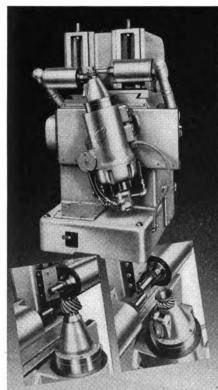
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ing a high degree of skill are integral parts of the manufacturing process.

The units in operation at Ashla are composed of a combination of 33-in. Cooper Hewitt mercury vaptube with four 150-watt incandesce Mazda lamps. The three imports plant operations of die making, c winding and assembly are all light by the new combination units.

"Skylight" units are used in a machine assembly department of a Gleason Machine Works, Rochest N. Y. This lighting furnishes a form, high levels of illumination the Rochester plant, and the works have no difficulty with shadows. Do to the detail-revealing qualities of a light, eye-fatigue is also eliminate.

In foundries or machine shops whigh bays, where closely controll light distribution is not required, to Type H or bulb type mercury vaplamps are economical and efficiently lamps productive the light output per wattelectricity consumed by incandescellamps.

The Tuthill Pump Company of Chago has recently built a new plate take care of increased producted demands. In their new long building with high bays, a production scheduled of twenty-four hours a day is in effect At the time of installation of the new lighting system, the Crescent Eigineering Company of Chicago recommended that they use the Type lamps. Use of the bulb type lamp on 12x14 ft. centers, mounted about 15 ft. from the floor, has greatly in proved the accuracy of their machine work.

While the bulb type units ar normally used for high bays, special diffusion reflectors are now available which make it possible to obtain quality light source combining maximum economy for general machine work. These units are especially

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adapted to lighting of large machine areas, particularly when production schedules require working on a three shift basis, and current economy is an important factor.

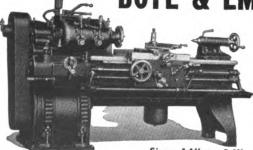
A fine example of the flexibility of mercury vapor lighting is to be found at the Monarch Machine Tool Company, Sidney, Ohio. Above certain of the production machines, straight Cooper Hewitt lamps are used as an aid to high precision work. In addition, bulb type mercury lamps are hung from the ceilings, about 15 ft. above the floor level, providing a high level of uniform lighting throughout the plant. This additional lighting eliminates almost entirely the need for drop lamps formerly used. In the drafting room, combination units are mounted on 10x10 ft. centers at a height of 12 ft. from the floor, furnishing 45 foot-candles of illumination on the drafting boards. All levels of illumination in produc-

tion areas are in excess of 40 footcandles, and in the newest buildings an average foot-candle intensity of better than 80 is maintained.

Because of the variety and flexibility of light sources now available for machine shop use, high standards of lighting may be obtained within practical cost limitations. It has been conservatively estimated that practically any machine can be adequately lighted for less than 1c per machine hour, including current cost, maintenance and depreciation. Since a machine hour supplies production worth possibly \$3 or \$4, if production be increased only one-half of one per cent, the saving will amount to 11/2 or 2c per hour, which is much more than the cost of good quality light.

The many benefits derived from sight-saving lighting conditions make it important to consider all the possibilities of each plant and its specific problems. To install lighting facili-

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Detroit Office: 4-252 G. M. Building, Phone Madison 931 New York Office: 75 West Street, Phone Whitehall 4-441 ties without taking advantage of the accumulated knowledge and experience of lighting engineers is, therefore, to take an entirely unnecessary chance in gaining the maximum of satisfaction from a new lighting system.

Molybdenum in Cast Iron. This publication is a loose-leaf fabrikoid threering binder containing four separate and individual sections devoted to the application of Molybdenum to cast iron, each section comprising a separate publication. Section I, titled "General", defines the term "cast iron" and to a certain extent interprets this definition in terms of the cast iron of older days and the modern Charts are included giving cast irons. the properties obtainable in unalloyed irons, in various sections, made by different processes, also showing the relation of blast pressure and cupola size and presenting the normal melting rate in tons per hour at various cupola diam-This section closes with a discussion of the effects of various alloying elements and a list of definitions and abbreviations for the various characteristics of cast iron.

Section II is devoted to alloy irons and particularly to the uses of Molyb-

denum in connection with cast iron. I addition to the discussion, photomics graphs are included showing the structures of gray iron without Molybdenum with 1.5 per cent Molybdenum unetche and the same etched. The text include a discussion of the mass effect in hear sections and on graphite, also porosi and shrinkage and effect of Molybdenum on physical properties. Photomics graphs illustrating the effect of Molybdenum on graphite in varying section A chapter is devoted to the heat treatiful of Molybdenum Cast Iron, Chrome-Milybdenum Iron and Nickel-Molybdenum Iron.

Section III discusses alloy combinations and presents photomicrographs plain iron, Molybdenum Iron, Chromidolybdenum Iron, and Molybdenum Iron, and Molybden

Copper-Molybdenum Iron.

Section IV discusses applications an presents information concerning the use of Molybdenum in iron for various purposes such as automobile castings, dismachine tool castings, gears, and so or A separate section comprising a general index is also included. Copies of this book are available without charge to me chanical executives who will address the Climax Molybdenum Company, 502 First Ave., New York, N. Y., on their first letterheads.

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Temperature Control in the Hardening and Tempering of Tool Steels

BY W. R. BENNETT

President, Bennett Insured Steel Treating Company, Newark, N. J.

THERE are still a number of old time steel treaters who are nominally successful without employing modern heat calibrating instruments. They are, however, decidedly in the minority. No man, however expert he may be, is able to determine by the eye alone the correct temperature of a hardening oven. In these days when a few degrees of heat more or less are important, heat calibrating instruments are important and no heating oven is complete unless it is equipped with temperature determining instruments.

The temperature indicated by the pyrometer, however, is only the oven temperature. It does not reveal the temperature of the work-piece that is being heated, therefore the operator must exercise his own judgment in determining the proper instant in which to remove the work.

For example: let us assume that we have a hearth-type semi-muffle furnace running at a temperature of 1450 deg. F. We know the instrument is registering correctly. The fire end, however, is located quite some distance from the piece being heated. Only by optical comparison between the color of the fire end and the color of the piece, therefore, are we able to determine the correct moment at which the piece must be removed for quenching.

One might inquire if it is not ad-

visable to allow the piece to in the oven for a sufficient lead time to admit of a reasonable tainty of its being heated to the temperature as the oven. would then be no doubt that the in the piece and the pyrometer ing will correspond.

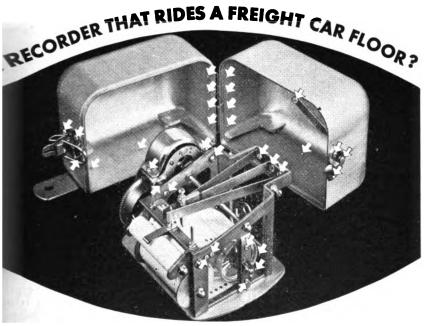
We have learned by experient that neither carbon tool steel nor hig speed steel should remain in a fir and be permitted to "soak" at an predetermined temperature, and also that both should always be quenched on a rising temperature. How there are we justified in "soaking" these particular steels?

There are some steels, particularly HiCarbon-HiChrome, that require certain amount of "soaking" at temperature in order to compensate for the presumable "lag" due to its chrome and carbon content. There are only a few steels, however, that admit of prolonged heating after the critical point has been reached.

In heating carbon tool steel, and also high speed steel, I have found it good practice to maintain an over temperature slightly in excess of that recommended for the piece to be hardened.

For example: The piece to be hardened requires a quenching temperature of 1450 deg. F. The oven temperature during the final heating may be slightly in excess of 1450 deg.

Could you make assemblies hold in



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esigners and production men once emloyed Parker-Kalon Self-tapping Screws rimarily as a means of simplifying assemly work and saving money. Now, however, undreds know that these cost-cutting Screws take stronger assemblies, too, and use them wen when strength is the prime consideraion.

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F. By optical comparison, one can readily determine the point just below the oven temperature at which the piece should be removed and quenched. Herein is one instance where the human element plays an important part in successful steel hardening. In the light of the above, it is reasonable to state that any heat calibrating instrument reveals only the temperature of the furnace at the point wherein the fire end happens to be located. Consequently, the closer the proximity of the fire end to the work being heated, as is the case with the Interoval, the more accurate is the heat determination obtained.

Determining Correct Temperatures by the Aid of a Hardness Tester

Practically every manufacturer of a good tool steel has, by careful research and exhaustive laboratory tests, determined the correct temperatures at which the various brands should be heated prior to quenching. The tool steel manufacturers not only furnish us with this information, but they also tabulate the specific hardness numbers, as revealed by hardness testers, which correspond with these temperatures. We are certain these tests are not made in a "slip shod" manner. Every step has been carefully checked with the sole idea of bringing out the best results in the heat treatment of their output. With this point in mind, we are furnished with the hardness number which a certain temperature should develop.

Assuming that we have several high speed steel pieces to treat in a furnace that is not equipped with a heat calibrating instrument if we note that 2300 deg. F. will develop 64 Rockwell with the 150 Kilo load on the C. scale, we bring the furnace to what we, by previous application, believe is or near 2300 deg. F.

The first piece is then heated, quenched and tested for hardness,

prior to following through remaining pieces. If the develops 64 R. C. we may that a continuance of the ing time and furnace temperature as like reading on the pieces.

This statement is not. condemn the use of a pwi from it. It is reasonable that one not equipped with # ture determining instrume also be without a hardne However, if both instrume prise the equipment, the test is a certain check-up on a meter that is operating inactural For forty-eight years the writer been treating steel and has les since the introduction of her testers, the close relationship bear to temperatures and call instruments.

Atmospheric Control

Aside from temperature conthere is another factor which is tinent to the successful operation a hardening furnace oven. The ployment of correct temperature not a guarantee of satisfactory he ening results. Practically all of representative manufacturers of betreating furnaces make it a point dwell on the fact that their furnace equipped with atmospheric ctrol. In the writer's opinion, should have been accomplished yeago.

The following was taken from most recent and authentic publicat on this subject.

"The knowledge of this subject at present in a stage of such revolution that it is difficult to expression without fear contradiction. Interest in the bilities of atmospheric control reduction and elimination oxidation has been awakened cent flood of discoveries.



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years will be required to digest and assort the amount of data recently published on these subjects."

The fundamental requisite for correct atmospheric condition is the exclusion of excess air or oxygen. It is therefore necessary to employ some means to bring about this result.

A furnace so constructed that it does not admit of its being run under proper atmospheric conditions is liability and should be discarded. the door opening of either a gas or oil fired furnace is as wide as the hearth or heating floor of the oven, it truly follows that when it is opened for the purpose of inserting or removing pieces, there is an inrush of air and if a number of pieces are being heated, those remaining will be immediately attacked by its oxidizing influence. The last pieces removed will show an increasing amount of scale or oxidization after quenching.

In other words, if the fire is running under perfect atmospheric condition when the door is closed, it cannot and does not maintain the correct condition when it is opened. The fact that there is about 14.7 pounds atmospheric pressure per square inch against any object at sea level is sufficient evidence that nothing will prevent its entrance into the oven.

Inasmuch as this is true, would it not be to our advantage if we were able to obtain and maintain correct atmospheric conditions indefinitely? This can be accomplished in a simple manner. Remove the furnace door entirely or open it to its full extent and block the opening with light semiinsulating brick, leaving an opening only sufficiently large to admit of inserting or removing the work-pieces. Adjust the fire to a non-oxidizing atmosphere by allowing the unconsumed products of combustion — ignited gas—to pass through the opening at a low velocity. This gas will immediately, on its contact, attack and consume

the oxygen of the air and prevent trance of the oxidizing element.

We must bear in mind that there as great danger of oxidation from t burner as there is at the door ope ing, and if we induce an exce amount of air through the burner, heating chamber will not function properly. While the front open may be filled to its full area wi flame, the oven is far from non-or dizing. This method permits one remove the heated pieces at will admits of moving the pieces on heating hearth, but does not interfe with the front opening at any time This particular atmosphere applies straight carbon tool steel and his speed steel, but does not apply to 🖼 correct heating of oil hardening ganese steel.

When one places a small piece dry wood on the hearth of a furns and it burns with a noticeable flame there is certain evidence that the fin is oxidizing. If, on the other hand the wood does not show this flam but simply takes on the heat of the oven, the fire is to all intents and purposes non-oxidizing. In the first instance there is sufficient oxygen burn the wood, and in the second little or none. At any event, the amount of oxygen is insufficient cause scale on heated steel. cess of fuel will maintain a "flat" or non-oxidizing fire. An excess of air will develop the opposite.

Tool Steel Containing Hard and Soft Spots

Carbon steels or tool steels are usually purchased in the annealed condition. The manufacturers of such steels have gone to no little expense in instituting equipment for the successful accomplishment of this object.

We, as steel treaters, are little interested in the annealing of bar stock. We are, however, faced with a condition from time to time that develops ble. While it is the exception er than the rule, I believe we in our experience found pieces bar stock, supposedly annealed, the were so exceedingly hard in that no tool was able to cut in. These spots show a much there surface after attempted maning than the softer portions, contently we are justified in the nion that the steel has not been formly annealed.

. piece of steel containing hard soft spots is primarily un-unimly hard and soft. If one prois with the ordinary method of lealing, consisting of heating the ce and allowing it to cool slowly ime or ashes, he is rewarded with indifferent job. This method does tend to uniformly soften the

tend to uniformly soften the ce. It does, however, result in atively softening the soft portion I reduces the primary hardness of hard spots to such a point that by can be machined.

The objectionable features resulting m the use of this method are: rst, the necessary time required; cond, the knowledge of possessing un-uniformly annealed piece with

tich to commence the job, with the tendant possibility of subsequent ficulties in the ultimate hardening eration.

The first requisite to a uniformly rdened job is a uniformly annealed ece with which to begin operations. have found that if one removes the ale or oxide and heats the piece the recognized hardening temperare and then quenches it in water brine, it will be uniformly hard. asmuch as we then have a piece even hardness, it is only necessary re-heat to a lower temperature an that used for the quench to be warded with a uniformly soft piece hich will machine readily. In this onnection it might be well to state at it is entirely unnecessary to heat a previously hardened piece of tool steel to a point within 150 degrees Fahr. of that required for hardening in order to anneal it.

Large tools made from any hardened steel should never be abruptly placed in a hot fire for annealing. It is always advisable to pre-heat slowly, in order to lessen the chance of sudden expansion and subsequent bursting. It is also good practice to materially reduce the temperature of a drawing or tempering medium prior to decreasing the hardness of tools of this nature.

The Long Draw

Unquestionably, retarded cooling after a piece has been hardened and drawn will add to its toughness without materially decreasing its hardness. If commercial steel treaters religiously followed the specifications appearing on some orders pertinent to the long drawback required, it would necessitate the employment of numerous heating units for a long period of time, increase the cost, and slow down production. For those not concerned with these objections, this method may apply. However, I am of the opinion there is a method which will attain equal or better results at much less cost than by a long drawback. Let us call it the "slow cool down".

Where specifications call for a 400 deg. F. drawback for a period of five hours on a die already hardened, we may employ an electric furnace or an oil bath for the operation. The furnace containing the die is gradually brought to the required heat and the temperature maintained for a period of five hours. The piece being heated has undoubtedly reached a thoroughly saturated heat equivalent to furnace or bath temperature long before the time specified. It is, however, allowed to remain its full time and either

quenched or permitted to cool in air at room temperature.

If the piece is quickly quenched after the "long draw", we are, in a great measure, defeating the purpose. If we allow it to cool in air it is quite materially benefited.

It has been my experience that the "long draw" when accompanied by either of the described cooling steps does not develop such results, particularly as related to toughness, as does the "slow cool down" after drawing. Neither do I believe it necessary to prolong the drawing time after saturation has been reached. A much longer period for cooling than either the quick quench or air cooling should be employed.

We are all aware that insulation, when correctly applied, will maintain heat or cold over an extended period of time. It is the slow cooling that develops toughness, and in order to accomplish this it is only necessary to place the piece, after its removal fi the drawing furnace, in a box a pack well with ground asbestos or a other suitable insulating mate

This applies to any steel. A p weighing five pounds subjected this treatment will be warm to touch after about twelve hours. sults: no furnace holdups, no accost and a tougher tool.

Cause and Prevention of Soft Exter Experienced With Treated Oil In ening Manganese Steels

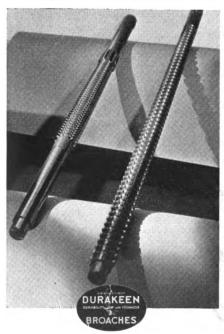
The following, taken from a scriptive pamphlet of instructions sued by one of the oldest establis steel concerns in the East, common "All oil hardening steels seem approne to surface decarbonization water hardening steels. This is portant, because it probably has great deal to do with explaining of wise mysterious inequalities in a duction. There is no specific for





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prevention, unless the piece of ground all over after hardening, control is a problem for partitools in particular plants."

Attention is brought to the a quotation because some of us an clined to take the other fellows clusions as gospel and do the effort to analyze for Surely the straight many hardening steels show a vertendency to soft exteriors hardening temperatures and heating may, in each case, I correct.

It is safe to say that, as at this occurrence, steel is demned because of this when, as a matter of fact, it is less and the fault lies solely as with the operator himself.

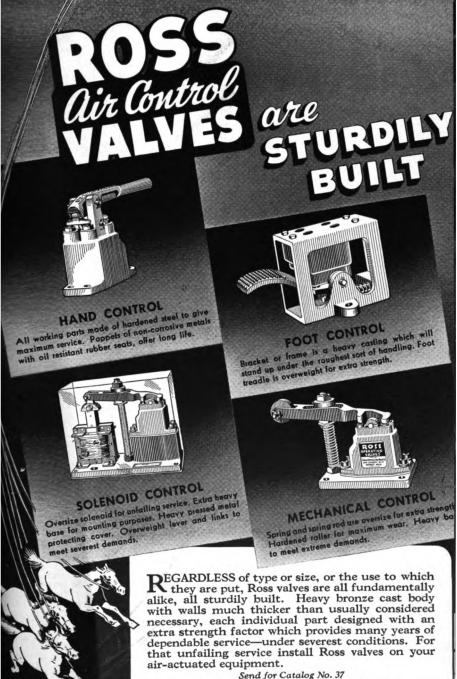
It is an easy matter to attribute this condition to "decarbonized". However, is not the as It might be well for us to contist exact opposite. This contist exact opposite. This contist exact opposite. A highly and nothing else. A highly atmosphere tends toward a contist exact opposite to the carbon and manganeses surface, thus throwing out the carbon and manganeses sult is a slightly Austenities which will be soft to the file.

A fire running close to the line, possibly on the "lean" or ing side, will develop a Mark structure the hardest known constituent. The piece after ing will show no evidence of a terior.

Hi-Carbon: Hi-Chrome

Practically all of the manufactor of this steel do, somewhere in the instructions for its treatment, remend pack hardening. From viewpoint they may be justified much as they are aware that hardening does, to an appreciate tent, eliminate soft exteriors.

It is undoubtedly true that



ROSS OPERATING VALVE COMPANY
6484 Epworth Boule Val C. Detroit, Michigan

BRIDLE FOR

aware that soft exteriors are a result of incorrect furnace atmosphere. They also know that this particular steel is more susceptible to this condition than other steels. By no stretch of imagination could they succeed in bringing about much needed results with a few written suggestions, consequently they advise the lesser evil—"pack hardening."

Why evil? Without entering into a discussion of chemical change or reaction which may be the result of pack hardening, we must admit our chief object is to obtain surface hardness. It is reasonable to assume that steel carrying such a high carbon content would not take on added carbon during the heating period, irrespective of what the packing medium might be.

We do know, however, that pack hardened Hi-Carbon: Hi-Chrome steel is more inclined to surface cracks as a result of grinding. We also know that if we are, by careful grinding, able to reduce or take off the first ten thousandths without developing checks, we can then, at necessary intervals, continue the grinding process with little or no danger of subsequent checking.

It is general practice to oil quench these steels from the pack. The possibility of distortion or cracking in the quench is not lessened by pack hardening.

Hi-Carbon: Hi-Chrome steel heated in a properly constructed furnace running under correct atmospheric condition is also oil quenched as a general rule. The possibility of distortion or cracking is still a factor, even though the piece may be uniformly hard.

Nearly all of this steel is air hardened. If we heat as described above and with no oil quench, allowing it to cool in still air, we find, after the piece has cooled to room temperature, a soft exterior with an exceedingly hard sub-surface. No doubt this surface is caused by the attacks oxygen during the cooling process.

By all manner of reasonings would assume this method to safest to adopt if we could only inate the soft surface, inasmutate possibility of cracking or distinguished to the possibility of cracking or distinguished.

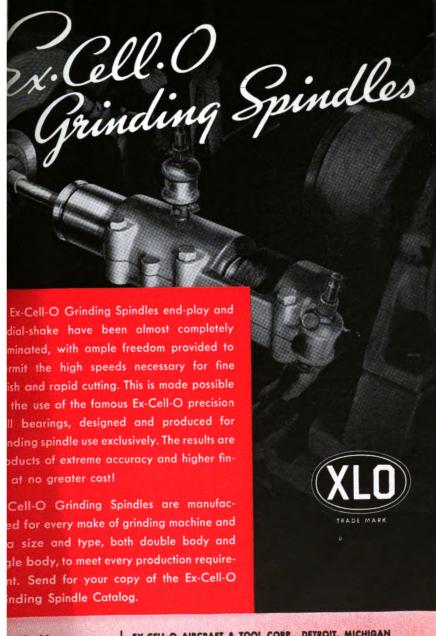
The answer reverts to the except of the attack of oxygen during cooling period. If the piece is moved from the furnace and submerged in a molten cyanid immediately withdrawn and aller air cool, there will be no attacked on the cold it may be placed in was water and the salts dissolved. It piece will be uniformly hard, for from surface defects, with no crade and no distortion.

(A booklet on the heat treating of tool steeds, which all of the above information is included, the sent free upon request to Bennett Innured B. Treating Co., 130-132 South St., Newark, N.

"Some Consequences of Graphitic Corosion of Cast Iron." Investigation show that the rapidity with which graphit corrosion of cast iron sometimes occur may be due to local galvanic effects between the porous galvanic coatings as the underlying metal. The development of protective coatings is influenced the size and distribution of the graphitic particles. Nickel alloy cast iros have favorable characteristics in the respect which probably account for the better performance in many corrosivents.

"Some Consequences of Graphitic Corrosion of Cast Iron" is the title of a recent publication dealing with the mechanism of a type of corrosion of cast iron that results in the formation of a surface layer of residual graphite. The publication is now being distributed by The International Nickel Company, Inc. 67 Wall St., New York, N. Y., and copies are available gratis to engineers and plant executives.

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Modern Equipment at Work

Arc Welding In The Arctic

By P. A. ROBBINS

Arctic Circle Exploration, Inc., Chicago, Ill.

AR north, on the bare Arctic tundra, eleven miles above the mouth of the Keewalik River where the latter discharges into Kotzebue Sound, several Eskimos garbed in parkies and mucklucks mingle with a small group of similarly clad white men. All of them shield their eyes from the white glare of the arc as a gasoline driven arc welding set rains molecules of metal on the break in a "bull-wheel," the large gear-wheel which swings the boom and cab of a dragline shovel.

And where is Kotzebue Sound? Follow the coast of Alaska out to the end of the Aleution Peninsula, round the point and bear north across the Bering Sea, cross Bering Strait—that narrow strip of water that separates America from Asia—and continue up the coast 200 miles, following the Arc-

tic Circle, and you are on the so of Kotzebue Sound.

It was a tragic moment for a ling group of miners working in the vicity of a hamlet called Kiana, nor east of Kotzebue Sound, when the heavy gear-wheel of their dragic broke. Tragic because they had rised their money to bring the dragic into a country where mining can only be carried on for about 100 days a year, from late June to early September. The rest of the year finds to country locked in the icy grip of water, its rivers frozen solid to the beds and the tundra a desert of sacred drifts.

There was only one chance to saw the season's work. To the southwest of them, down the Kobuk River, across Kotzebue Sound, and up the Keewalik River they knew that Arctic Circle Exploration, Inc., had a wellequipped mining outfit at work at a little settlement called Candle. In-



The welder is mounted on skids so that it can be hauled across country by tractor.



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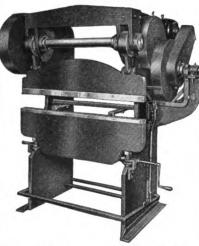
A new Norton development which you should try on your tool grinding operations — especially satisfactory for high speed and sensitive, hardened tool steel alloys.

Alundum and Crystolon are Norton trademarksiregistered in the U. S. Patent Office for tused alumina and silicon carbide respectively—also for products made from these materials.

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No. 253



Does 40% to 60% of the forming work turned out by the average shop.

Here's a profitable, economical brake ideally adapted for rapidly forming metal sections such as in stoves, refrigerators, soda fountains, steel cabinets, metal furniture, steel boxes, and a great variety of sheet metal specialties. Its variable speed drive operates from 17 to 50 strokes per minute. The No. 253 CHICAGO STEEL PRESS is accurate, compact, and ruggedly constructed of highest quality materials.

Sizes 4, 5 and 6 ft. capacities, up to 10 gauge.

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CHICAGO

ILLINOIS

cluded in the equipment at Candle was a General Electric gasoline-drive arc-welding set.

The broken bull-wheel was loaded in a "umiak", a native boat made a skins, and for five days an Esking crew paddled down the Kobuk, around the shore of the sound, and up the Keewalik River to the settlement of Candle. Here, within three hours their arrival, the pieces of the broken bull-wheel were assembled and welden into place. Instead of the ruince loss of a season's work, the interruption lasted only two weeks.

The files of Arctic Circle Exploration, Inc., are filled with similar stories of loss avoided by means of arc welding. A stripped pinion on a dredge threatened to be the cause of a serious loss of time. An airplane was summoned by radio and a messenger dispatched to Nome to search through mining stores and scrap piles for substitute gear but before he returned unsuccessful, the old gear had had a new set of teeth built up from welling rod and had been returned to service with the loss of only one day.

Miles of pipe line stretch across the tundra, pipe from 15 to 30 inches in diameter, and when Ys, or Ls, or Ts, or bends are needed, they are fabricated on the job, made up from bits of pipe welded together in the desired form.

Thousands of three-quarter inch thawing pipes are in use, each length of pipe having a special steel point welded to it. When the points need to be replaced, because of breakage and wear, the job is quickly done with that welding machine.

Worn machinery parts are built up with welded metal, as are parts reclaimed from the scrap heap. Innumerable odd jobs, each important though small, are executed successfully through the short, intensive working season. Dredges, tractors.



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aluminum alloys? Drilling manganese steel? There's a Morse Tool made for each job-made so it will do that job in a way that will prove to you "There is a difference".

If you have special requirements which the Morse distributor cannot meet from the wide Morse line, our engineers will be glad to work with you. No matter what the job, a side-by-side trial of Morse Tools with other makes will demonstrate, "There is a difference".

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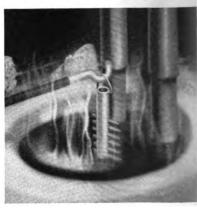
draglines, and scrapers must be kept at work every hour possible. The gold to pay the costs must be wrested from the frozen gravels of the valley so delays can not be countenanced.

The gasoline-driven arc welding set at Candle is always on the job, ready to serve. It is not permanently installed in the shop, but instead is mounted on skids so that it can be dragged across country by tractor to the place where its service is required.

Heat Treatment of Cutting Tools Ensures Quality

In order to ensure the production of cutting tools of the highest quality, the Putnam Tool Company, 2981 Charlevoix Ave., Detroit, Michigan, is now using the salt-bath process in the heat treating of the entire line which comprises their product. This method calls for the submersion of the tools in four successive salt

baths, in which uniform temperature are constantly maintained by the use of special electrical controls. The



Submerging Putnam tool in salt bath for best treatment.

tempering is done in a Homo electric furnace, after which the tools are



What is the "FACE VALUE" of a Dial Indicator?

The "face value" of a Dial Indicator is its ability to give accurate readings at all times—even after continual rough treatment.

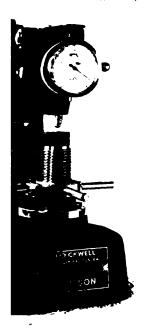
The Standard Dial Indicator has a high "face value". Its new Shockproof construction protects delicate mechanism from shocks that would destroy the precision of the average Dial Indicator.

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STANDARD GAGE GO. INC.





may mean either specifications or spectacles.

Wouldn't it be fine if we could give you "Specs" for your nose that would enable you to observe if the heat treatment "Specs" on your blue prints had been observed in the hardening operations. We almost can.

Just slip a "ROCKWELL" with its direct reading dial, between your eyes and your specimens and you will see true hardness and know what you've got. Use the "ROCK-WELL" as your "Specs" for "Specs".

WILSON

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New Yerk, N. Y.

finished by shot blasting.

In this process two salt baths are used for preheating at temperatures of between 1500 and 1600 deg. The third bath is for "high" heating at from 2300 deg. F. to 2350 deg. F. The fourth, or quenching bath, is held between 1100 and 1200 deg. F. After submersion in the quenching bath. the tools are allowed to cool in still air and then are arranged in wire baskets and placed in the Homo electric furnace, where they are tempered in a temperature between 1025 and 1075 deg. F. After removing from the tempering furnace, they are blasted, in a special blasting chamber, with minute particles of steel shot.

Due to the fact that the tools are completely submerged in the solution and are heated in a perfectly neutral atmosphere, there is no possibility of oxidation or scaling. No decarburization occurs. The possibility of distortion is precluded by the fact that every portion of each tool reaches the

same temperature at exactly the statime.

Landis Catalog K-137 18 illusta book describing and Landis 12x28-In. Universal Grinder, manufactured by Tool Company, Waynesboro, Pe plete description of the grinder, head, headstock, traverse drive, on, is presented, together with graphs of the various parts. One is devoted to typical operations can be performed on the grinder standard equipment, including tions of the universal head, footstock. universal tooth center rest.

Another section lists the open which can be performed with and additional equipment — the grinding attachment, internal grinding attachment, internal grinding attachment, adjustable circular forming tool grinding ment, gear cutter grinding attachment, face of grinding attachment, end mill grinding attachment, surface grinding attachment, surface grinding attachment, magnetic chuck, and the magnetic plate. Specifications of attachments and a listing of standard equipment are included. Copy free upon request.



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AT LOWER COST

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With a Peerless Surfacer you eliminate the time and expense of gluing and drying grind ing wheels and discs.

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IS . CHAIR

Ideas from Readers

This department is a clearing house for ideas . . . If there is a "kink" or short cut in use in your shop, send in a description of it . . . Each one published will be paid for.

Solving a Difficult Boring Job With a Vacuum Cleaner

BY CHARLES C. LYNDE

THE oil field machine shop probably is confronted by more unusual work demands than any other type of jobbing shop, due to the great number of various kinds of equipment in use in the drilling, production and

dash-and-dot line) entailing the removal of approximately 80 pounds of metal through the "bottle-neck" of 7½ in. of 1%-in. hole through the flange and neck of the plunger.

Due to the relatively small hole through which work must be done, and the fact that 305 cubic inches of iron had to be removed, the problem of chip removal slowed down the work

more than other one factor. Since the boring bar practically filled the "bottleneck." there was no chance for the

chips to work out along it during progress of the boring. Blowing out the chips with compressed air cleared the hole, but was unsatisfactory in that it sent a shower of fine dust all over the shop to the detriment of other work being done, while dismounting the plunger and allowing the chips to gravitate out entailed much unnecessary set-up work.

Finally an old vacuum cleaner of the common household type was secured and set up alongside the boring job. Then, each time a cut was finished and the bar withdrawn from the plunger, it was easy to start the cleaner, thrust the hose into the aperture at the flange, and quickly suck out through the hose all chips and dust.

So accurately was the work done to leave the specified wall thickness of one inch in the finished plungers that although the incoming weight of plungers varied by as much as ten



Drawing indicating amount of stock to be removed from interior of a pipe-line pump plunger.

pipeline departments of the petroleum industry. An example of the kind of work that keeps the days-and nights -from becoming monotonous is the plunger from a 6x24-in. pipeline pump which came in to be worked over.

As originally cast in the foundry of the pump maker, the cast iron plunger had a cored recess extending axially from the flange to about 7 inches from the pressure end. cored hole, 1%-in. in diameter, was not for the purpose of lightening the plunger, but to relieve shrinkage strains and prevent the formation of cracks or spongy metal.

The plungers, 18 of them in all, weighed originally an average of 286 pounds apiece. They were 6 inches in diameter at the working barrel, and 44½-in. in length. The work to be done was that of enlarging the original cored hole to approximate that shown by the lightly dotted line in the drawing (original hole shown by



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Alloy Steel Back can assure full life from a High Speed Steel Edge

Because it is hard and wear-resisting, genuine High Speed Steel makes the finest cutting edge—fastest cutting, longest lived. But because it is hard, high speed steel is relatively brittle—though best for the teeth, it is ill suited as a backing for the teeth, since the backing must be non-brittle to withstand the strains and shocks of tensioning, reversing, and feed load, without breaking. Only MARVEL High-Speed-Edge offers the "perfect ideal,"—the only hack

saw blade with genuine high speed steel tooth edge integrally welded to a tough, non-brittle, non-breakable, chrome-vanadium steel back or body. Only by standardizing on MARVEL can you be sure to get full life and genuine high speed efficiency.

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High-Speed Edge

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"The Hack Saw People"

146

pounds, the weight of the finished work checked to within half a pound and all checked for concentricity of bore when balanced on parallel knife edges.

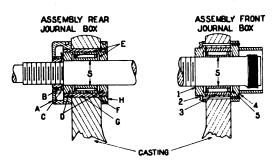
Simplified Design of High Speed Spindle for Brown & Sharpe Automatic Screw Machines

By WALTER G. PORTER

THE present-day trend toward higher cycling speeds in automatic machine operation often proves a handicap to the small jobber, as he finds it difficult to compete on large quantity jobs when the only machines available are standard-type automatic machines. However, this limitation on speed is imposed only by the plain-journaled spindles, and in view of this fact, the writer designed the spindle illustrated here.

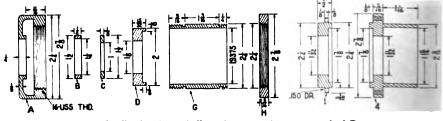
The standard spindle and machine casting were used, together with parts shown in the drawing. A vical boring mill was used to bore the cradle of the machine to take roller bearings. With this impresent, the machine-spindle has been at speeds in excess of the cran at speeds in excess of the cran without dangerously overhing the bearings.

The assembly consists of the lowing parts: (A) Thrust adjustment collar. Material, cold rolled stank, pack hardened to 50 C Rockwell. (B) and (C) These parts are the same as used in the standard assembly and need not be replaced unless they show excess wear. (D) Locating bushings, used to hold roller bearing outer race in a neutral position. These parts are turned to a tight press at in the part marked G. Material is phosphor bronze. (E) and (5) This part is leather (old belting is ideal)



G>McGILL NEEDLE ROLLER FR-





Drawing of roller bearing spindle and parts to increase speed of Brown & Sharpe automatic screw machine



AN Improved MOLYBDEN HIGH SPEED STEEL

ON SOME JOBS IT GIVES MIGHTY FINE PERFORMANCE

Actual production results and heat treating uniformity stamp VAN-LOM the first major improvement in Molybdenum High Speed Steel. 25% to 40% Better Cutting Properties.

A new booklet telling how VAN-LOM came into existence and also how to heat treat it, is available for the asking. Write for it on your letterhead.

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Interchangeable and Replaceable Pads of Hardened Steel, Iron or Bronze



Double angle on sides of pads permit worn pads to be brought back to gripping size by grinding down angles and allowing tension of master to bring pads closer together



Spreaders furnished with fingers permit pads to be changed quickly and easily. No pins or screws to hold pads in master

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cut to fit into the counterbores i parts (D), (1) and (4). The hole is α slightly small so that it will hug th spindle bearing surface tightly and thus prevent chips or dirt from enter ing the roller race assembly. McGill Precision Type Needle Roller Bearing No. FR 11/2 in. (G) Rolle race retainer bushing. Material, cast iron or brass. (H) Thrust adjust ment collar, threaded internally to fit Material, cold rolled steel part G. Pack hardened to 50-55 Rockwell C. (1) Front journal rear race retaining Material, cold rolled steel (2) Two special No. 8-32 thd. screws. as shown. Material, cold rolled steel (3) McGill Precision Type Needle Roller Bearing No. Fr. 1% in. Front journal front of race retaining collar. Material, cold rolled steel.

The dimension (S) is the nominal diameter of the spindle bearing. In the case under discussion, this dimension was 1% in. at the rear and 1% in. at the front. However, if the machine has been run for any length of time, it will be necessary to have these two journals chrome plated oversize and reground on centers to a tap fit in their respective roller bearing inner races.

The two screws which hold parts (1) and (4) against the cradle should be drilled through the two collar flanges and the cast iron cap, but due to the spindle pulleys, assembly is impossible if other screw holes are drilled through the main casting.

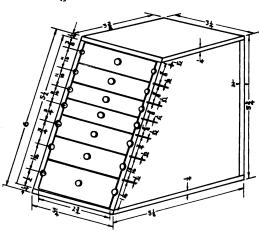
The spindle is assembled in the same manner as a standard spindle. The entire spindle, bearings and all, can be removed from the cradle by merely removing the caps from the front and rear journals. If all the parts which need to be made over on account of the roller bearings are made exactly according to the drawing, no matching or fitting other than the usual amount of hand adjustment will be necessary.



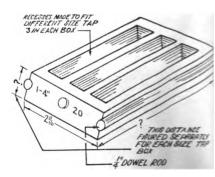
Tap Cabinet

By C. F. FITZ

APS are often purchased in sets and an attempt is made to keep the sets together, but in many cases this becomes a problem. The boxes in which the taps are shipped from the factory are usually of cardboard which break easily or soon become oil-soaked and fall apart, with the result that the taps either are lost or roll around in the box. In the latter case they strike against each other and dull the cutting edges. To overcome these difficulties, the cabinet illustrated in the drawings was made.



Drawing of home-made tap cabinet.



Each drawer is a solid block of wood, recent to take taps of the size desired.

The cabinet is intended especial for taps from ¼ in. up to an including % in. The cabin is made from plywood. the drawers are made fre solid blocks in which recessed have been cut to hold the taps. Thus the drawers carnot come apart, and only by the very roughest uses could one be broken. shown by the drawing, the sides of the block drawers were recessed for dowel rods. corresponding recesses being cut in the sides of the cabinet so that the drawers will slide. However, the method of providing slides for the sides of the drawers can be varied to suit the individual



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BALDWIN - DUCKWORTH
Suppose you had to clean and polish 16,000 lamp sockets, door knobs or other similar
tems an hour? This new Udylite polishing machine could do it for you economically,
n part because of the generous use of 3 different types and sizes of Baldwin-Duckworth

oller chain; and over 100 Baldwin-Duckworth accurate-cut sprockets.

When you want to "clean up" on production costs, there's a good chance the best answer s the right Baldwin-Duckworth roller chain. Consult our engineering department or a detailed analysis of your particular job. Baldwin-Duckworth Chain Corporation, pringfield, Mass.



ideas. The knobs are of brass, fastened with flat head wood screws.

The entire cabinet was given a heavy coat of black shellac to prevent it from becoming oil-soaked. The sizes of the taps in the various drawers may be painted on with white paint, or stamped in metal tags which may be attached with screws or brads. The cabinet has not only saved many taps that would otherwise become lost or damaged, but has also saved a considerable amount of time that was

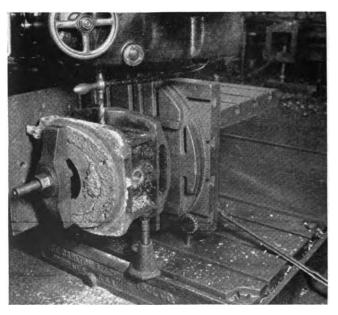
previously lost in searching for the right size taps.

Geared Fixture for Radial Drill

BY G. F. CAGLE

HEN an old machine is scrapped, it is sometimes possible to salvage portions of it for use as accessories to other machines. For instance, the geared fixture shown is

use in the illutration was made from an old boring mill table Used in connation with a verical surface plate it forms an sch mirable piece d for equipment radial drill work The old table not only has all the necessary T-slos for clamping work, but it also has teeth cut around the periphery by which





Geared fixture made from old bering miltable aids in handling work on radial drill.

ELIMINATE SPECIAL AUD COSTLY JIG FIXTURES

By Using Yost Drill Press Vises

They are heavily constructed and very compact. Three flanges on the base permit easy attachment to machine or drill press table. A "V" shaped slot milled in the movable jaw permits a positive locking of vertical work. The ease and simplicity in operating makes this tool an indispensable factor in the execution of drill press operations.

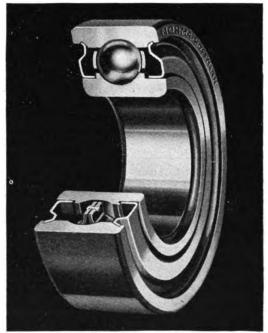


Write us for circular "H", giving us name of your nearest dealer.

YOST MANUFACTURING COMPANY, MEADVILLE, PA

'9000-DD", with Double Metal Seas, here shown; also nade as "9000-D" with Single Metal Shield.

LARGER GREASE CAPACITY . NO SEAL DRAG



IN "9000" SERIES (Feltless)

SELF-SEALED BEARINGS

Interchangeable in dimensions with felt seal bearings.

Employs simplified, inwardly extending, flanged metal shields which do not rotate and cannot "foul" other rotating seal parts.

Seals are highly efficient in retaining grease in either horizontal or vertical position.

Simple seal occupies less space within bearing than felt seal, PROVIDING GREATER GREASE

CAPACITY AND A MORE LASTING LUBRICANT SUPPLY.

Metal seals, though close fitting, clear recess on inner ring, ELIMINATING "DRAG" OR FRICTIONAL RESISTANCE and power loss, and providing higher starting speeds and increased efficiency. Seals cannot wear and are permanently effective.

Totally sealed against foreign matter, providing absolute cleanliness at all times.

<u> Norma-Avffmann</u>

Precision Bearings

BALL, ROLLER AND THRUST

NORMA-HOFFMANN BEARINGS CORP'N., STAMFORD, CONN., U. S. A.

with the aid of a pinion, the table can be adjusted to locate the work at any angle desired.

In the case illustrated, the driving box has been set up to have holes drilled in it to aid in the welding-in of liners. The operator uses a small square as an aid in setting the table accurately. The end of the pinion shaft has been squared to fit a ratchet wrench with which the pinion is revolved.

Chronolog Booklet. A new booklet describing three new models of Chronologs, production control instruments, has been published by The National Acme Company, 124 East 131 Street, Cleveland, Ohio.

This booklet gives complete information on the use and operation of the Chronolog, claimed by the manufacturer to be the only instrument that keeps a running record of time and a count of pieces on the job—and prints this information on a chart that may be read as easily as a typewritten report. A new line of super-sensitive line voltage switches and Namco Solenoid are described in the same booklet. Copies may be obtained on request.

Norton Grinding Wheel Markings are fully explained in a folder being distributed by Norton Company, Worces ter, Mass., to aid the user in purchasing grinding wheels. A typical marking 3848-J5B, is broken down to show the reader the meaning of the various part of the marking. This booklet should be useful to all users of grinding wheels and a copy may be obtained by addressing the Norton Company as above.

"Build Your Own" Hobert Welden Generator. This folder, issued by Hober Brothers Company, Troy, Ohio, gives de tails on the Hobert plan for building portable welders. The Hobert "Built Your Own" Unit consists of a welding generator, exciter, reactance, control terminals and flexible coupling built into a single, compact unit weigh can be connected with a gasoline engine or motor. Features of the Hobert Arc Welder are presented, together with photograph of welding outfits in use in various part of the country. Copy free upon request



SIDNEY TAPERED SPINDLE NOSE

SIDNEY has now adapted the standard tapered spindle nose as optional equipment on the Tritrol 16-speed, Sidney 12-speed and SIDNEY Precision Tool Room Lathes.

Advantages: More power — greater ease in removing face plates and chucks—brings face plate and chuck closer to the front spindle bearing.

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"Lathes and Milling Machines"
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6 more light is yours from these modern light sources. They it instantly and hang horizontally to give the best light dispution. You save, in addition, because you can run more lamps a circuit. The improved appearance has added to the immediacceptance by industry of this improved lamp.

Even in the most difficult places you are assured an ease of eing that profits both the worker and the manufacturer. These w "24-hour skylights" produce a soft, non-fatiguing light that reals detail . . . promotes better work . . . and reduces errors. There's a representative nearby who will be glad to give you implete information. He will gladly survey your needs and tell to what modern Cooper Hewitt lighting can do for you. If you efer, write directly to the General Electric Vapor Lamp Comency, 897 Adams Street, Hoboken, New Jersey.





There is no glare from polished metal surfaces... scratches are easily detected... eyes are rested ... and better work is more easily accomplished with the "better than daylight" illumination of the new horizontal Cooper Hewitts.

Over the Editor's Desk

IN AN address before the Thirty-sixth Annual Convention of the National Machine Builders' Association, last month, Clayton R. Burt, President of the association, made a few remarks which could very well be passed on to other manufacturers. Following are some excerpts from Mr. Burt's talk:

"We are ** disturbed by the current recession of business, which is occurring in spite of the well-known shortage of housing, foodstuffs, materials, and equipment. To replenish these needs should keep all of our industries running at full capacity. machine tools alone, we know that our customers have scarcely begun to replace the old equipment that is no longer giving efficient service. one can blame executives or managers for the cautious policy that they find it necessary to adopt, but we regret that the aggregate of production in many lines is less than is actually needed to supply the wants of the whole people at prices they are able to pay.

"As one example of misdirection on the part of the government, due to a lack of comprehensive understanding of industry's financial problems, I cite the Tax on Undistributed Surplus laid upon corporations by the 1936 Revenue Act. ***This particular legislation will, if continued, defeat the aims of the administration in several directions, not the least among them the stabilization of production and employment, which is so vital to pros-

perity.

"Those who were responsible for this law were not fully informed of the importance of corporation reserves to the country during the bad years of 1930 to 1934. During these years, while the government spent eight billions of dollars in an effort to restore a normal balance, corporations spent over eighteen billions of dollars more than they received. To do this they not only had to have a surplus on

hand, but that surplus had be readily available in cash quick assets; not tied up buildings nor frozen in finished goo for which there was no market.

"Any conservative executive consiers it his first duty to restore his depleted cash reserves when business a turns, in order that his company making the prepared to face the next emegency. The surplus tax provision, making this almost impossible, place a heavy penalty on industries like of own, where earnings not distribut to stockholders are appropriated the government in the form of tax and these earnings are lost as a bad log for the industry.

"Its financial position must then gauged purely on current busing Its credit will fluctuate with the W ume of orders, or lack of them. Wit out means to finance employment dull times, its employees will suff the same risks as the stockholder no orders, no work, no dividends, a no purchasing power. The possible ties that this surplus earnings t carries for hastening and prolongi depressions are appalling, and a tainly were not taken into consider tion by the authors of the bill whi was so hastily put through to become a law.

"***The normal growth of a coporation is ordinarily financed out surplus. We are now told that indutrial expansion should be paid for of the sale of new securities.**I large corporation with a national reutation can easily find a market fits securities. It is extremely diffict for the small concern to raise capit in this way.

"The net result is to favor the epansion of large corporations at the expense of the smaller ones, and the smaller ones are essential to our national well-being. **These smaller porations are not only employers thousands of people, but they represent the most effective check on trend toward monopoly."

Revision of this Act is necessar

s on Let's have some action!

SCREW THREADING

with Adjustable TOOLS



Clean, accurate threads at the lowest possible cost—that's what you want when you buy threading tools. But solid dies and taps wear down and lose their accuracy, and they cost more than a set of chasers for a Geometric solid adjustable tool.

With the DJ Die Heads and SJ Taps, the Chasers are easily removed, making accurate resharpening simple. Better manufacturing methods are possible, too, so that we can guarantee the accuracy of the chasers. The chasers can be adjusted in the tool with precision—they can't lose size! And a single tool will cut a wide range of sizes.

Geometric adjustable tools are strong and sturdy, with rigid chaser support and positive locking, yet small and compact. When small production or space limitations prohibit the use of self-open-



ing tools, or on short threads where backing off is not objectionable, a Geometric solid adjustable tool is more accurate, more economical, than a solid die or tap. May we send you catalogs?

THE GEOMETRIC TOOL CO.

NEW HAVEN, CONN.

New Shop Equipment

Ex-Cell-O New Line of High Speed Multiple Boring, Facing and Turning Machines

An entirely new line of high production, high speed, multiple boring, facing and turning machines has been added to its precision boring machine line by Excello Corporation, 1202 Oakman Blvd., Detroit, Mich. The new line comprises

Fig. 1—Ex-Cell-O Three-Way High Speed Multiple Boring, Facing and Turning Machine

both two and three-way types, with from two to nine boring spindles.

For parts requiring boring, turning or facing operations from more than one direction, the machines eliminate the possibilities of errors in machining arising from locating parts in separate fixtures on different machines for individual machining operations. For parts requiring operations from one side only, multiple fixtures provide much higher productivity per machine hour.

Notable among the features of the new line is the unusual compactness of these highly flexible units and the high productivity possible, exemplified by the complete boring and facing, in one setup, of such parts as differential carriers in a total cutting time of only around 37 seconds.

In the three-way machines, shown in Fig. 1, it will be noted that the boring spindles with their individual moted drives are separately mounted on sliding tables. Table feed is by the well-known Ex-Cell-O hydraulic system with individual hydraulic pumps for each table Standard Ex-Cell-O precision ball bearing spindles are used mounted in special

heads for compactness and so designed that additional spindles may be added "required.

cycles 17 Cutting completely automatic Each table is provided micrometer-ac justment dogs for setting the distance approach fast dwell, cutting. fast return. The dwell period at the end of the cutting stroke separately adjustable for anything from one to 30 seconds to insure desired finish characteristics with minimum of time per operation. A rapid advance between two holes bored by one spindle may also be provided for in the cycle.

Spindle speeds are constant for any par-

ticular job, and designed to give a cutting speed of around 400 feet per minute with carbide cutting tools. Feeds may be varied from nothing to 42 inches per minute to meet any requirements at to materials to be cut as well as types of work and character of finish required. If high speed cutting steels are to be used, lower spindle speeds are, of course, provided.

Individual starting controls of the push button type are provided on the control panel shown for the electric motors operating the spindles are pumps, with two additional button permitting simultaneous starting an stopping of all motors.

A similar flexibility is incorporated

travel controls. Each table is with a separate lever control individual operation, or all a may be started and stopped igle lever shown to the right d-wheel in Fig. 1. The inditrols, of course, are highly setting-up or re-tooling any carrier. Furthermore the adjustable that carriers may fed in simultaneously or in

thines illustrated here are or dry cutting. A sump is the base of the machine, to permit

of a coolIn that
lant pump
ff one of
ic control
Chips
through
the mare ejected
k of the
through
rn adjae center

clamped fixtures, being of type, allydraulic ted fixture used, with ycle.

type is cast in one piece me alloy iron and is aged being normalized. It is id for maximum rigidity. ication is provided for the te of which is flat; the l. The entire machine is rovide the maximum in brationless operation for work.

universally adjustable axially as well as transfrom % in up to six in ay be bored. Maximum 12 in. A fixture pad of ides ample support for handle large parts. Rerapid approach is 11 ft.

type is similar in design iy model. In this type umps are provided, along-;, back of the machine. ; the three-way machine, o a wide variety of muling and turning operamachine, also, cutting operations may be simultaneous from both sides or alternately, as desired. The machine may be used equally advantageously for two-way machining of a single part, requiring counter-boring, for instance, or for simultaneous or alternate machining of separate parts to permit processing of one, while loading the other.

For continuous production, this twoway type can be equipped with a vertical or horizontal multi-station, rotary indexing fixture permitting the performance of a multiplicity of boring, turning and facing operations.

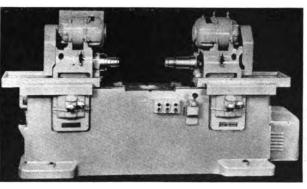


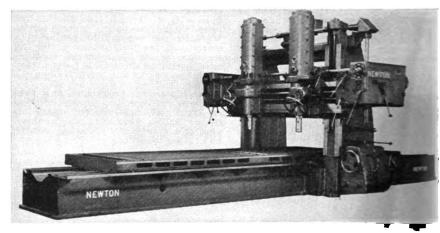
Fig. 2—Ex-Cell-O Two-Way High Speed Multiple Boring, Facing and Turning Machine

The Two-Way Precision Boring machine is available in a number of different sizes to accommodate varying sizes of work.

Newton Two-Head Planer Type Drilling and Boring Machine

The machine illustrated herewith has been brought out by Consolidated Machine Tool Corporation, Rochester, N. Y., for the precision drilling and boring of large castings where numerous holes must be accurately positioned, drilled and bored. The outstanding feature of the machine is the provision made for precision positioning. Both heads and table are provided with a hand wheel and both are equipped with end measures, inside micrometers and dial indicators. The boring bars are provided with power rapid traverse vertically and heads have rapid traverse across the rail. Rail and tables are each provided with power feed and traverse.

Operation of the machine is facilitat



Newton Two Head Planer Type Drilling and Boring Machine

by large dials which can easily be read from the floor. Dials on each head indicate directly in r. p. m. the speed of the spindle at all times. Large dials on each gear box show the feed per revolution.

Boring bars carried in two saddles are double-splined to fit the driving gears, which have extended hubs mounted in precision Timken bearings. At the upper end of each bar is an additional bearing ring in a slide with roller thrust collars to take the thrust of the cut. The right hand head is operated from the gear box at the right hand side of the rall and control of the left hand head is from a gear box at the left end of the rail.

The table can be built in one piece or in two sections as illustrated. The two sections can be coupled together or used separately so that one can be loaded while the other is in use. Tables are mounted on one V and one flat way and continuous feed for the combined length is provided through the angular rack under each table. Tables are also equipped with milling feeds through a worm and rack drive to provide for milling the sides of castings where a side unit milling head is desired.

Crossrail, uprights, girt and bed are of heavy box section. Reinforcement is generously provided through heavy cross ribs, thus insuring utmost rigidity. Two adjustable speed motors are required for the driving heads, and the rail and one constant speed motor are required for driving the table. A small motor is also required for rapid traverse of the rail.

The two rail gear boxes are lubricated

by self-contained pump, and the tab gear box is splash lubricated. Force feed lubrication is provided for the be ways. All other points are lubricated in means of a centralized one-shot ster The machine can be built in scramof sizes to meet specific requirements.

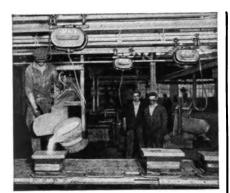
"Toledo" No. 57-A Single and Double Action Press

For general utility purposes, the sing action press with built-in drawing custions to do double action work has be come increasingly popular. A new display of the popular "Toledo" No. 57-press, shown herewith, brings out sominteresting angles on this combination. The press, product of Toledo Machine Tool Co., Toledo, Ohio, is fitted with semi-built-in heavy duty "Marquett hydro-pneumatic die cushion. In ihigh range this cushion gives about the normal blankholding presure, adapting the unit to shape-stretching jobs which require a very high gripping pressure around the edge of the blank. On such work it is entirely posible to use gripping pressures equal or exceeding the drawing pressure.

The use of high blankholding presures, particularly with deep draws, it volves a decided increase in capacity the whole driving train on the press, it cluding the flywheel and motor. Frequivalent work this naturally puts it single-action machine and cushion in it price class of the equal double-active toggle press. Thus the single action is

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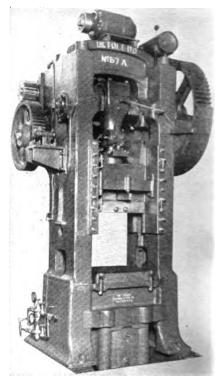
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has advantages in suitability to single action work and in convenient holding pressure control for double action work. On the other hand, the toggle double-action press has advantages in positive gripping for stretching jobs with draw beads and in power economy on deep draws.

The press shown in the photograph is manufactured by The Toledo Machine



Toledo No. 57-A Single and Double Action Press

& Tool Co., Toledo, Ohio, a division of E. W. Bliss Company. This press is a double-geared, single end drive, single-action press with a gear ratio of 16 to 1, which gives a speed of 22 strokes per minute. The 10 h. p., 1200 r. p. m. high slip motor drives the flywheel by means of V-belts. Electric push buttons control the multiple disc air-operated friction clutch, making it possible to inch. run or stop the press. All main bearings are bronze-bushed and are lubricated by means of the manifold type one-shot



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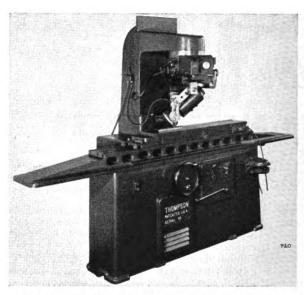
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Thompson No. T-20 Automatic Broach Grinding Machine

system. Some of the more important dimensions are as follows: Stroke, 10 in.; adjustable for 4 in.; shut height, stroke down, adjustment up, bed to slide 20 in.; bolster thickness, 4 in.; crankshaft, 6½ in. dia. at bearings and 9¾ in. at the pins; bed area, 32 in. by 32 in. The slide is counterbalanced by a weight in the gear wheel. The self-contained "Marquette" hydro-pneumatic cushion makes it possible to draw a shell up to 4¾ in. high.

Thompson No. T-20 and No. T-47 Automatic and Manually-Operated Broach Grinding Machines

The Thompson Automatic Broach Grinding Machine illustrated herewith has been designed by The Thompson Grinder Company, Springfield, Ohio, for the sharpening and manufacturing of flat or surface broaches. The machine is operated automatically and the tooth spacing is determined automatically.

A small locating finger positions the broach tool relative to the grinding wheel. The wheel head is provided with a intudinal slide and we to accommodate vartooth and rake any The entire wheel in unit may be adjusted angular relation with the broach in order to go the teeth at an estalished angle with the

The table operates timed relation with is stroke of the wheel is and can be operated a variable speed. Twheel head is design for 6-in. diameter gring wheels and the speed 3600 r.p.m.

The No. T-47 Manus Operated Machine is designed that the broateeth are located according to a predetermine spacing or from estallished teeth. Both automatic and the mually operated machinare built in 6x48-in. 60-in., and 6x72-in. si

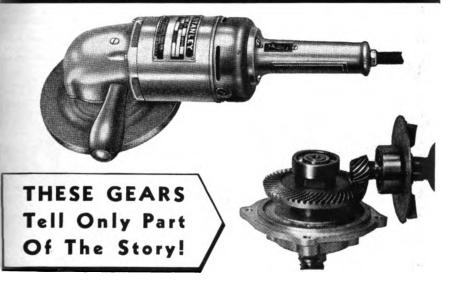
Marquette Compact Slide Com

The Marquette Tool and Mig. Co. 1 Hastings St., Toledo, Ohio (division



Thompson No. T-47 Manually Operated Broach Graing Machine

New STANLEY 7" Disc Sander



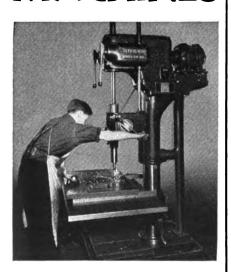
Gears are mighty important in a disc sander's life. That's why Stanley uses these spiral bevel gears for smoother action and long service.

Motors are important, too! Stanley powered this tool with a motor similar to that used in the Stanley $\frac{1}{4}$ " Electric Drill. And mounted the shafts on oversize ball bearings designed to take the end and side thrust of the man who "leans on" this grinder.

Stanley No. 77 is a double handful of action — useful in any shop for sanding, grinding, buffing of steel sheets, castings, welded joints; for aluminum, bronze, fibre, and wood. Ask your Stanley distributor for a demonstration to prove that this tool is right in speed, in weight, in balance and power. Or write for further information. Stanley Electric Tool Division, The Stanley Works, New Britain, Conn.



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SLIDING HEAD --

Round or Square Column

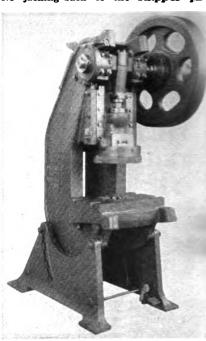
At work in the plant of the Brust Tool Manufacturing Company, Chicago, well known makers of precision tools and fixtures, this round column 25" Cleereman Drill is giving highly satisfactory performance . . . It is fully geared . . . has anti-friction bearings . . . is automatically oiled . . . has single lever control of feeds and speeds . . . can be furnished with square column and in special arrangements . . . Write for descriptive bulletin.

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Green Bay, Wis.

E. W. Bliss Co.), is announcing a compact pneumatic slide cushion. The cushion is mounted under the slide, as shown in the illustration, and can be used in conjunction with Calleson blanking drawing and curling dies to replace the springs or rubber cushions. It is equally adaptable to stripping and blankholding operations.

The functioning of this cushion as a stripper has a number of advantage. No jacking-back of the stripper place

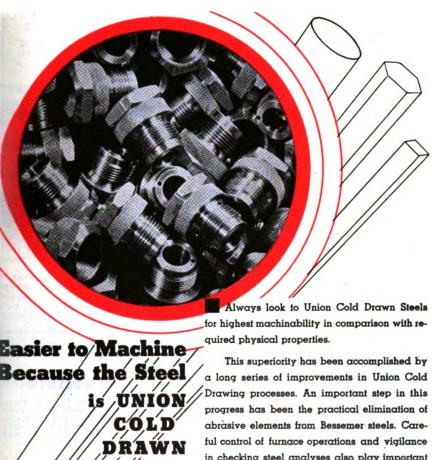


Marquette Compact Slide Cushion in Use
Bliss Press

against stiff springs is necessary when setting dies. All that is required is to release the air from the cushion and the stripper plate will easily slide back out of the way. Furthermore, it is possible to control the stripping in a positive manner so that the cushions will operate at the correct moment.

It is possible with the use of these side cushions and the regular cushions in the bed to convert a single-action press into a triple-action press.

When these cushions are used with Calleson dies, the cushion and the draw ring proceed downward together, blank-



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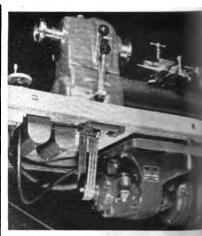
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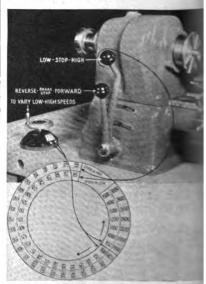
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are available in each position of transitorq lever. The long lever great low-stop-high speed change and the short lever gives reverse-brake stop-toward speed change. Levers operate estrical motor controls. The short less applies a spindle brake.



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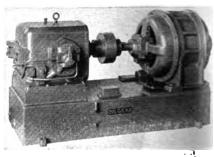
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Oilgear Fluid Power Variable and Constant Displacement Pumps and Motors, marketed by The Oilgear Company.



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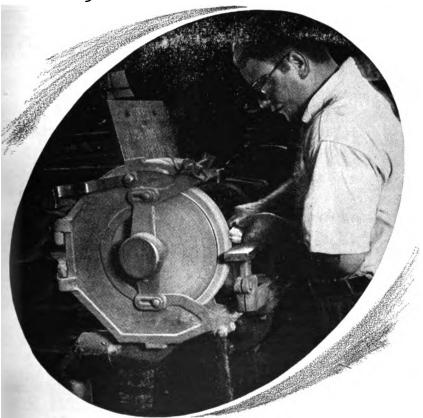


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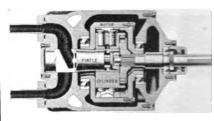
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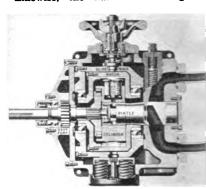
on top of the piston is accurately finished to work with the conical surface of a hardened and ground reaction ring. Piston reactions are transmitted from a single spot on the convex surface of the head to the concave surface in the reaction ring. This contact spot being offset from the axis of the piston and the rotor unit being eccentric from the cyl-



Plan View of Section of Oilgear Constant Displacement Unit

inder block causes the piston to reciprocate and partially rotate back and fort simultaneously. Both of these motion are uniformly accelerated and decelerated. The action imparted is similated that used in lapping a small pisto into its cylinder, the extent of each metion being governed by the stroke of the pump.

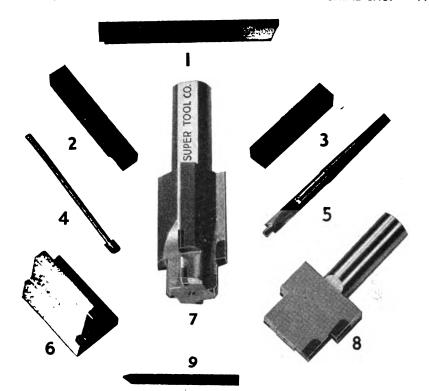
Likewise, the hardened and groun



Plan View of Section of Oilgear Variable Diplacement Unit

reaction ring is of one-piece construction securely mounted in a rotor running of anti-friction bearings. The conical surface is ground to work with the control surface of the rolling pistons.

Since the rolling pistons are smal many can be placed in the cylindric



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SUPER TOOL COMPANY

356 EAST CONGRESS ST. DETROIT, MICHIGAN

area of the cylinder and additional rows can be placed compactly in the longitudinal section of the cylinder. This makes possible a line of compact pumps and motors in conventional sizes from 2 to 150 h. p. with working pressures of 1100, 1790 and 2500 lbs. per square inch.

to 150 h. p. with working pressures of 1100, 1790 and 2500 lbs. per square inch. Smoothly and quietly the balanced rotor revolves on anti-friction bearings mounted on a fixed center in the case or in a movable slide block to vary the stroke. Interchangeable devices of various types flanged to the unit case select the movement of the slide block and provide accurate direct or remote control of the fluid power function.

Oligear Variable Displacement Pumps and Motors consist of a variable stroke piston unit and a suitable control mechanism compactly arranged in a case. Each variable displacement unit consists of a pintle, a cylinder barrel with seven or more closely fitted pistons, one or more reaction rings, a rotor and slide block. The cylinder barrel lined with anti-friction metal rotates on a fixed alloy steel hardened and ground closely fitted pintle, which is pressed into the case. A floating coupling flange, splined to the input shaft, which is mounted on anti-friction bearings, drives the cylinder barrel. Centrifugal force keeps the convex surfaces of the roller-bearing

alloy steel hardened and ground rolls pistons against the concave surface the reaction ring at all times. The surface and rotor end head which contain a reaction rings are mounted on he anti-friction bearings and rotate with the cylinder barrel through contact the rolling pistons against reaction for head of the rolling pistons against reaction for head of the control ways in the case and enected to the control mechanism contact the complete rotor unit and is used, vary the stroke of the pistons.

The illustration shows the Variable Displacement Unit with its simple Type "S" Hand-Wheel See Control which consists of a large sessifianged to slide block, a long works nut, a hand-wheel and lock nut. The hand wheel provides accurate control the slide block position and hence it volume of oil displaced. Compressor springs opposing the control hold to slide block firmly against the control mechanism.

Built into each front housing is a internal gear pump for partially super charging the main system and for operating hydraulic controls. On one-way variable displacement pumps a combine suction and return valve is flanged at the bottom of the case. Two-way variable displacement pumps use an auto

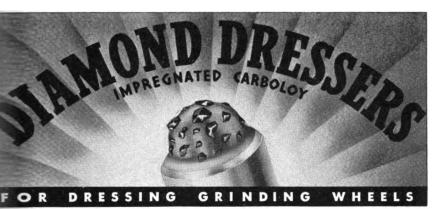
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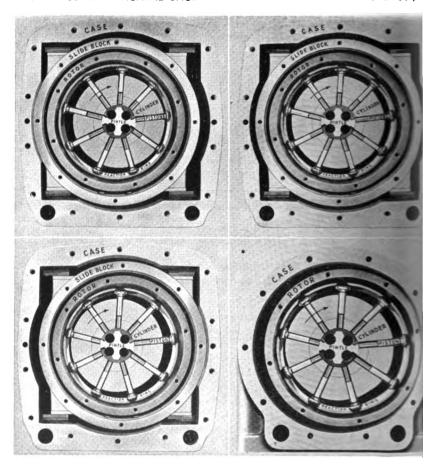
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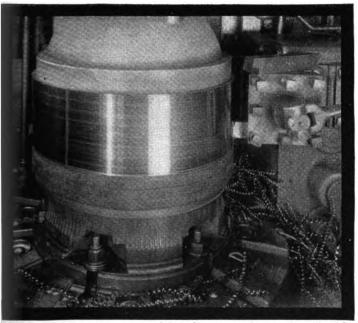
Ollgear Variable Displacement Pumps. (Upper left) View showing alide block, rotor and restring unit with its centerline moved to left of cylinder, pintle and drive shaft centerline. Of delivered through upper port. (Upper right) View showing slide block, rotor and reaction unit with its centerline concentric with cylinder, pintle and drive shaft centerline. Neurono oil is delivered. (Lower left) View showing slide block, rotor and reaction ring unit its centerline moved to right of cylinder, pintle and drive shaft centerline. Off is delived through lower port. Oilgear Constant Displacement Pumps. (Lower right) View show rotor and reaction ring unit with its centerline at a fixed eccentricity to right of cylinder, pintle shaft centerline.

matic two-way suction and return valve. These connect with the main system through drilled and cored passages. Suitable suction and return tubes are also supplied. Built into the case and connected to the main system through drilled and cored passages are relief valves for limiting the pressure of the variable displacement unit and auxiliary gear pump.

Variable displacement motors are sillar to the pumps except that they quire no suction and return viv They come equipped with or with an internal gear pump.

an internal gear pump.

Each constant displacement unit of sists of a pintle, a cylinder barrel seven or more closely fitted pistons or more reaction rings and a rotor. So cylinder barrel lined with anti-fixed



Finish turning O.D. of ring gears, .670" thick, eleven rings on fixture per load. Material: S.A.E. 1045, Brinell 170-187. Tool used: V-R, Grade E, Style 11, 1 ¼" x 1 ¼" with 28° chip breaker. Performance of V-R tool:

Tool Used	Speed	Feed	of Cut	Cutting Time, Load	Production per Grind
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VASCOLOY-RAMET BLANKS

Vascoloy-Ramet is available in three forms, (a) completely finished tools, (b) milled and brazed tools, and blanks. \ blanka are furnished in 5 standard styles and in sizes to meet every require-ment. To make tools with V-R blanks is a simple operation, fully described in a new instruction booklet, available free -upon request.

District Sales (Pittsburgh	
Latrobe New York	Pa
Springfield Boston	Mass
Providence	. R. I
Cincinnati Cleveland	. Ohio
Detroit Chicago	III
St. Louis Buffalo	N. Y
Philadelphia Newark	. N. J
Knoxville Los Angeles	Tenn
San Francisco.	

metal rotates on a fixed alloy steel hardened and ground closely fitted pintle, which is pressed into the case. A floating coupling flange, splined to the input shaft which is mounted on anti-friction bearings, drives the cylinder barrel. Centrifugal force keeps the convex surfaces of the roller bearing alloy steel hardened and ground rolling pistons against the concave surface in the reaction ring at all times. The rotor and rotor end head which contain the reaction rings are mounted on large anti-friction bearings in the case at a fixed stroke and rotate with the cylinder barrel through contact of the rolling pistons against the reaction rings.

One-way or reversible constant displacement pumps come equipped with an external flanged type adjustable relief valve for limiting the pressure in the system. They are available with or without an internal gear pump and

built-in relief valve.

180

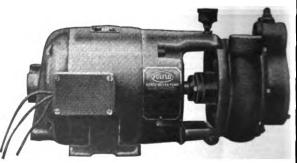
In Oligear Variable Displacement Pumps, the pump shaft is driven clockwise from any constant speed source of power. This rotation is transmitted directly to the cylinder barrel mounted on the fixed pintle in the case through a splined floating coupling flange. Radial pistons in the driven cylinder barrel are confined in the rotor by concave reac-

tion rings while the rotor is carried on anti-friction bearings in the adjustable stroke slide block. Oil is carried to and from pistons through flanged pipe connections, cored passages and drilled pasages in the case, pintle and cylinder. When the centerline of the cylinder

and rotor coincide, no reciprocating motion is imparted to the pistons as the unit rotates, so no oil is delivered. the slide block and rotor unit are moved to the left by the control mechanism. reciprocating motion is so imparted to the pistons that those passing over the upper port in the pintle are delivering oil to that port while those passing over with oil. When the centerlines of the cylinder and rotor do not coincide, the differences between the radii from the center of the cylinder to the points of contact of the several piston heads with the conical reaction ring surface in the rotor unit cause the piston heads to move faster or slower than their points of contact with the reaction ring. This difference in speed is adjusted by slow partial rotation of each piston in its bore, in one direction during one-half revolution and in the opposite direction during the other half revolution. The pistons thus rotate and reciprocate simultaneously.



CENTRIFUGA COOLANT PUMPS



The Pumps of well balanced design and construction. They can be mounted in any position and perform to perfection.

Regardless of grit and chips centrifugal pumping action insures dependable flow of cooling solution at all times. Specifications: Choice of either 34-1/3-34-34 H. P. splash proof motor with enclosed ball bearings. For standard voltage or current. Pumps deliver from 25 to 70 gal. per minute at 10 ft. head. Cast iron bedy with bronze impeller. Either straight or priming cover. Spring tension packing. No bearings in pumps

FOR FULL INFORMATION WRITE

FULFLO SPECIALTIES CO., INC. BLANCHESTER, OHIO



The phetograph shows, more clearly than words, the shining smooth finish of ELEPHANT BRAND PHOSPHOR BRONZE BUSHING BARS. So made, not to glorify a hard-bitten, two-fisted metal—but to save you the time, trouble and wasto attendant upon machining from scaly castings! And, to save tool upkeep, too.

Twelve inch bars come machined with 1/32" plus O. D. and 1/32" minus L. D., up to and including 3" diameter . . . and from 3" to 6" inclusive, with 1/16" plus O. D. and 1/16" minus on the L. D. Maximum L. D. S-4".



There's plenty of stock for final machining, yet no superfluous metal. Stock and price lists on 214 STANDARD SIZES—yours upon request. No obligation.

THE PHOSPHOR BRONZE SMELTING CO.

2206 Washington Ave., Philadelphia, Pennsylvania

As the slide block and rotor unit are moved to the right of the cylinder barrel centerline by the control mechanism, reciprocating motion is so imparted to the pistons that those passing over the lower port in the pintle are delivering oil to that port, while those passing over the upper port are sucking or filling up with oil. The position and movement of the slide block is controlled very accurately, thus permitting the oil delivery to be varied smoothly over a stepless range in either direction from zero to maximum.

In the Oilgear Constant Displacement Pumps, the pump shaft is driven clockwise or counterclockwise from any constant speed source of power. This rotation is transmitted directly to a cylinder barrel mounted on the fixed pintle in the case through a splined floating coupling flange. Radial pistons in the driven cylinder barrel are confined in the rotor by concave reaction rings while the rotor is carried on anti-friction bearings mounted in the case at a fixed eccentricity. Oil is carried to and from the pistons through flanged pipe connections, cored passages and drilled passages in the case, pintle and cylinder. When the pump shaft rotates clockwise constants are constants.

When the pump shaft rotates clockwise, reciprocating motion is so imparted to the pistons that those passing over the lower port in the pintle are delivering oil to that port while those passing over the upper port are sucking or filling up with oil. Since the centarlines of cylinder and rotor do not coincida, the differences between the radfi from the center of the cylinder to the points of contact of the several piston heads with the conical reaction ring surface in the rotor unit cause the piston heads to move faster than their points of contact with the reaction ring. This difference in speed is adjusted by alow partial rotation or rolling of each piston in its bore, in one direction during one-half revolution and in the opposite direction during the other half revolution. Thus, the pistons rotate and reciprocate simultaneously.

Driving the pump shaft counterclockwise causes the pistons passing over the upper port in the pintle to deliver of to that port, while those passing over the lower port are sucking or filling

with oil.

No. 14 Producto-Matic Knee Type Milling Machine

A knee and column type milling a chine in a light design with power a to the table, to be known as the life Producto-Matic, has been added



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OF QUALITY AND SERVICE

FILES

American Swiss Files are Swiss Pattern Files manufactured in the United States of America.

The choice of the most discriminating mechanics.

More than 2,000 regular different shapes, cuts and sizes from which to choose.

It is not the cost per file; it is the cost of the finished job that counts.

Buy from the Distributor

AMERICAN SWISS FILE & TOOL CO., Elizabeth, N. J.

Also Manufacturers of Mechanics' Hand Tools and Knurls



A Hevi Duty Vertical Retort Carburizer at the Cleveland Pneumatic Tool Co. Many of the important parts of "Cleco" tools are carburized in this furnace because of its dependability to consistently produce a uniform case.

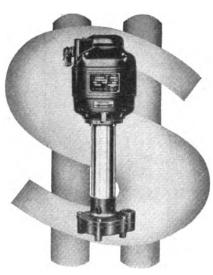
Send for Bulletin HD \$37. It describes the Vertical Retort Carburiser.

DUTY ELECTRIC COMPANY HEVI



MILWAUKEE, WISCONSIN

DOLLARS AND SENSE



From a dollars and cents angle—it's sensible to buy the quiet, economical and uninterrupted service found in the Ruthman "Gusher" Coolant Pump.

A "Gusher" pump needs no priming and has no foot valves or metal contacts. Chips and abrasives pass through the pump without injuring the mechanism.

Ruthman offers a pump for every type of machine tool built—designed to meet every modern cutting need.

Write for free data sheets.



the line of machine tools built by T. Producto Machine Company, Bridgepa Conn. The machine is of compact design with a one-piece column which enclose the motor, oil pump and reservoir, complete transmission for controlling spins speeds and table feeds, and acts as substantial support for the knee, said gear box and table.

Possibly the most interesting partite construction comprises the use V-pulleys and belts to secure 12 changes of spindle speeds and 6 changes of the



No. 14 Producto-Matic Knee Type Millin Machine

feeds. The feeds or speeds are changly simply shifting the belts from a step to another and by reversing pulleys the number of changes can doubled. A powerful, steady, quiet a self-contained drive is provided to cutter spindle and to the gear box of trolling the table feed.

The speed of the motor is 1200 r.p. There are 12 spindle speed changes g

The speed of the motor is 1200 r. p. There are 12 spindle speed changes ging speeds from 72 to 1300 r. p. m. table feeds are provided giving ta feeds varying from 1% to 11 in. minute. All pulleys and shafts in transmission rotate on anti-frict bearings in a bath of oil. The cut spindle, which is alloy steel harde and ground all over, rotates on two T ken roller bearings which are constant lubricated. The spindle end has a 40 National Standard Taper.

The table feed mechanism consists of telescopic universal drive shaft from e transmission into the gear nich is mounted on the under side of e saddle. The overarm is 3-in. diamer and has a large support for the itter arbors. Either a standard center a support with bronze bushings for sle A or B cutter arbors is used. The achine accommodates standard attachents and tools such as a vertical millg attachment, 5-in. swivel vise, 6-in niversal index centers, end mill adapts, standard cutter arbors, and so on. The base of the machine is 32x28 in. d the height to top of column is 53 Floor space required, 47x37 in. Range the longitudinal power feed table is in., with 16 in. obtainable. Cross at range, 7 in. Vertical feed of table, in. Distance from face of spindle to nter of table: minimum, 4 in.; maxiım, 11 in. Overall dimensions of table, 19 in. Working surface, 26x6 in. Cutspindle, 2-in. diameter x 18 in. long h No. 40 National Standard Taper Net weight, approximately 1550 le. ınds.

Automatic Machine for Fluxing

The Automatic Gasflux Company, veland, Ohio, is marketing a machine

designed to automatically dispense brasing flux. The gas line runs through the machine and as the gas passes through it is impregnated with a special flux. The flux then travels with the gas to the torch tip and is expelled in the flame.

The special flux used is the result of long experiment by Gasflux engineers. It has a low melting point and as a result, coupled with the fact that it is dispensed in a minimum quantity heretofore unobtainable, the flux creeps ahead of and is always under the brasing puddle. It is said to penetrate thoroughly and quickly, preparing the metals in such a way that an unusually tight weld is secured.

The value of low temperature brasing has long been recognized, particularly in joining dissimilar metals or light and heavier gauge metals where the amount of heat applied becomes an important factor. This process, by speeding up low temperature brazing, is said to overcome the heat factor. The new process accurately and automatically controls the amount of flux used, making it impossible to use too little or too much and eliminates the depositing of the hard, enamel-like substance which often forms when an excess amount of flux is used. Thus no pickling is necessary and

Be SURE you get both f these: Our Treatise on Fi-

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Our Treatise on Fibre! Answers your questions about vulcanized fibre; a book you'll want to keep in your files — for handy reference when the fabrication of small parts is your problem.

Swedged or UPset. Washer Sheet . . . a list of stock sizes for which we have



the special tools, in convenient reference form. Keep this on file to specify and order with minimum effort.

WILMINGTON FIBRE SPECIALTY COMPANY
MANUFACTURERS OF GENUINE VULCANIZED FIBRE

WILMINGTON, DELAWARE

copies sent

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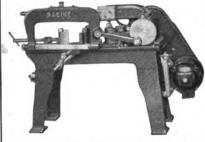
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RACINE

ANNOUNCES

The New RACINE Utility Saw



Here's a low-priced 6"x6" machine that is ideal for the small shop or as auxiliary equipment in the large shop.

Here are a few of its money-saving features:

Modern design—Accuracy in cutting — Rapidity in production — Freedom from complications—Long blade life—Hydraulic feed, simplified and engineered by pioneers in the application of hydraulics to metal cutting machines. Write for descriptive literature.

Also hydraulic feed heavy duty machines, 10"x10", 12"x12", 10"x16" and 13"x16".

RACINE Shear Cut, Screw Feed, Production Saws, 6"x6" and 8"x9".
RACINE Duplex Band Saws, 14".

"Standard the World Over"

RACINE Tool & Machine Co.

1770 STATE ST. RACINE, WISCONSIN very little grinding is needed. The formity and quantity of flux distriction governs the porosity and surficendition of the brazed joint.

The Gasfluxer and Gasflux can be used with all types of equipment as



Automatic Gasfluxer

well as any standard gas. No changes are required in torches, tips or regulators. Any experienced welder can use the equipment without special instructions. One Gasfluxer assembly of the proper size will provide flux for as many torches as may be required on a single gas line.

L-W 10½-In. Full Universal Dividing Head

The full universal dividing head shown in the illustration in 10½-in size has been placed on the market by L-W Chuck Company, 20 N. St. Class

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THE STANDARD TOOL CO.

St., Toledo, Ohio. This full universal head is intended for use on all kinds of indexing and spiral cutting. The rear



No. 10 B & S taper and

an arbor can be furnished for differential

indexing, making a wide variety of indexing available. Three index plates are furnished dividing all numbers to 50 and even numbers to 100, excepting 96. The index chart furnished gives all divisions obtainable up to 380 with full instructions for obtaining the divisions desired.

The headstock is graduated to IB deg. and is built so that it can be tilted above and below the vertical and

perpendicular lines. The worm is hardened and ground, accurately and adjustable for wes and takeup through eccentric bushing. worm is easily dist gaged by simple movement and locking device Worm wheel ratio is 40:1 It is keyed to the spinds assuring positive movement when engaged by the worm.

The spindle has a pered bearing and

to take up end thrust. A 21/4 in 1 pitch thread is provided on the spindle Although listed as 10½ in., the head actually swings 11 in. All material and workmanship are of the highest quality

and every part is carefully inspected before and after assembling.

Equipment includes a set of change gears, quadrant, and idler bushings. spindle arbor for differential indexing can be furnished on order. Shipping weight, 180 pounds.

High Speed Tapping Plus Revolutionary Flexibility

No wonder announcement of the Procunier Universal Tapping Machine has pro-duced a cyclone of interest! Just consider these features:

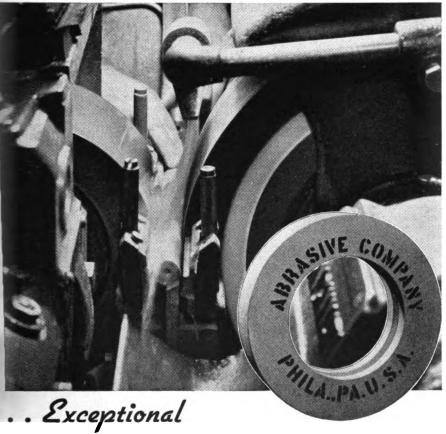
- Five speeds, ranging from 385 to 2240 R.P.M.
- Tap capacity from No. 8 to %" using two interchangeable heads.
- Preset feeding and back-ing out pressures, inde-pendent of operator, uni-formly maintained thru long helical springs with wide range of adjust-ment.
- New protection for taps through Procunier Sensitive High Speed Tapping Heads.
- Automatic lubrication of tap with accurate timing and volume adjust-

Other valuable features include foot pedal operation, precision depth stop with calibrated depth indicator, large working table with in-tegrally-cast drain trough trough and precision h height adjustment. hand-screw

Catalog mailed promptly on

Procunier Safety Chuck Co. 12 S. Clinton St. Chicago





CENTERLESS GRINDING WHEELS

For outstanding performance specify ABRASIVE COMPANY GRINDING WHEELS on your production centerless jobs. Recent tests clearly show exceptional results that mean real economy. Details sent on request.

ABRASIVE COMPANY

TACONY AND FRALEY STREETS, PHILADELPHIA, PA., U. S. A

DIVISION OF SIMONDS SAW AND STEEL COMPANY



Thor U14R Right Angle Portable Electric Drill

Having a possible working clearance of only 2% in., the Thor U14R 3/16 in. and ¼ in. capacity right-angle portable



Thor "U14R" Right Angle Drill

electric drill which has just brought out by the Independent Pneumatic Tool Company, 600 West Jackson Blvd., Chicago, Ill., is said to have the smallest working clearance of any right angle drill on the market. The drill head on this new unit measures only 2½ in. overall and the angle attachment can be turned and clamped into any position, making it possible to drill in places formerly inaccessible.

This addition to the extensive Thor line weighs only 3 pounds and is but 91/4 in overall. The streamline design 9% in overall. The streamine design and compact construction permit perfect one-hand operation. Equipped with 1/16 in., 3/32 in., % in., 5/32 in. and 3/16 in. collets for twist drills, it offers a wide drilling range. It can also be supplied with spindle to take 3/16 in. The Chuck. Spindle offset is 13/32 in. The U14R operates at a speed of 2700 r. p. m. It can also be furnished with speeds of It can also be furnished with speeds of 3750 r. p. m. (U13R) and 5100 r. p. m. (U15R). Construction features include triple-insulated hand-wound armature commutator built on brass sleeve to eliminate high bars and floating seg-ments, alloy-steel, spiral helical gears and radial vent cooling system.

Sabin Type A3 Hand Truck

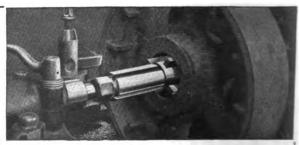
The Sabin Machine Co., 6538 Carnegie Ave., Cleveland, Ohio, has recently placed on the market its Type A3 Truck on the market its Type A3 Truck adapted for convenient and speedy handling of wood or steel barrels and drums from keg size to 36 in. high.

This new truck is featured by an at-

tachment device consisting of a hook and a tongue member adjustably

With NICHOLSON EXPANDING MANDRELS

you have available for immediate use internal chucks for holding any hurry-up break-down job that comes along. Can be used on lathes, grinders, shapers or millers. Take any bore—1/2" to 7". Made in fourteen sizes. Bulletin 530.

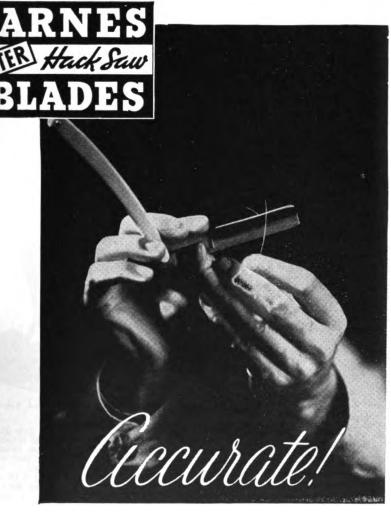


and 4-Way CONTROL VALVES for operating single or double acting air, steam, water or oil cylinders. Made in lever, foot, solenoid and motor operated. All pressures up to 3000 lbs. Bulletins on request.



Other Products: Arbor Presses, Flexible Couplings, Steel and Stainless Ball Floats, Steam Traps and Separators, Air Separators, Traps and Vents, etc.

W. H. NICHOLSON & CO. 136 OREGON STREET, WILKES-BARRE, PENNA.



Finer than hair-splitting—that's how accurate Barnes "Red Arrow" Blade performance is. And that's because "Red Arrows" are carefully made of the best high speed steel, with teeth properly milled, accurately set. Your supply dealer can introduce you to this top-notcher among hack saw blades.

W. O. Barnes Co. Inc. Detroit Mich.



FOR SAFE, SPEEDY LOW COST CUTTING

of steel alloys, non-ferrous and fibrous materials of all kinds in various sizes, angles, and shapes up to 3½" inclusive. Machine is built to carry abrasive wheel 16" diameter by 3/32" or ½" thick. Vise for straight or angle cuts up to 45° is standard equipment.

Send for Bulletin giving complete description of this machine.

THE CINCINNATI ELECTRICAL TOOL CO.

Division of The R. K. LeBlond Machine Tool Co. CINCINNATI, OHIO, U. S. A.

BUILDERS OF

The Cincinnati

Ball Bearing Electric Drills, Screw Drivers, Nut Setters, Tappers, Valve Grinders, Aerial Grinders, Tool Post Grinders, Floor Buffers, Bench and Floor Grinders. mounted on the vertical column. In operation, the tongue member is positioned about one inch above the lower edge of the barrel chime while the truck is held against the barrel at both top and bottom. The hook is then placed over the edge of the barrel and the wheels allowed to roll back until the tongue slips under the lower edge of the chime. By means of the handle and the



Sabin Type A3 Hand Truck

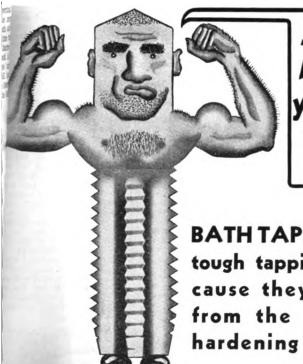
foot pedal the wheels are now pushed up to the load, which is thus raised off the floor and attached to the truck. It is then quickly tipped to the balancing position and easily moved.

The wheels are 10 in. by 3 in. mounted on roller bearings, and can be furnished.

The wheels are 10 in. by 3 in. mounted on roller bearings, and can be furnished with steel, hard-rubber or pneumatic tires. The axle is 1½ in. in diameter and the overall width of the truck is 25 in. It is stated that with this new type of truck one man can easily pick up and transport loads up to 900 lb., the design being particularly adapted for operation in restricted spaces.

Brown & Sharpe Cam Lock Arbor

The tool shown in the illustration is a cam lock arbor which has been brought out by Brown & Sharpe Mig.



Let ME
handle
yourtough
tapping
jobs

BATH TAPS can handle tough tapping jobs be-cause they're ground from the solid after hardening . . .

TH TAPS are tough all the way through — from core to — the same perfect hardness.

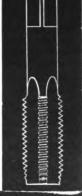
use these teeth are not dulled by heating, they stay sharp er, cut more accurately and allow more tapped holes per tap.

you this means lower costs, greater accuracy, and higher action — in a word, greater profits.

ATH TAPS on your tapping jobs - especially the tough ones.

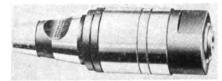
HN BATH & CO., Inc.

WORCESTER, MASS.



PAYS TO BUY BATH "Ground From The Solid" TAPS

Co., Providence, R. I., for use with cutter adapters and milling attachment spindles with a cam lock. This arbor makes it possible to use certain small milling and other cutters with cam lock adapters, providing for them all the ad-



Brown & Sharpe Cam Lock Arbor

vantages of positive drive and quick cutter change of the patented Brown & Sharpe Cam Lock Cutter Adapters.

The arbor is made in two sizes; No. 30-7/8D-2 and No. 31D-2, diameters of which are % and 1 in. respectively. The length from shoulder to nut is 2 inches.

"Majestic" Metalayer

The "Majestic" Metalayer recently developed by the Metals Coating Company of America, 497 N. Third St., Philadel-

phia, Pa., will deposit approximately !! per cent more metal over a given to with approximately one-third less cays and acetylene consumptions per well of metal deposited in larger size withan previous models of this equipmer The mechanical problem of feeding her ier wires, at greater speeds, required new departure in the method of gears and increased bearings throughout with out the introduction of excessive weigh or unwieldly size.

With the efficient design of the ta bine, a small increase only in the presure and volume of compressed air required over tools of lower capacit The train of gearing from the turbit to the final feed roll consists of the hardened worms, one bronze and or fibre gear, respectively, of special corposition, and the entire gear assembly is enclosed in one compartment containing grease, insuring perfect lubrication. Wearing parts have been reduce to a minimum and any changes or reduced to the compartment of the compart pairs necessary can be readily effected.

The feed rolls are conveniently ex gaged by an adjustable latch bolt oper ated with a single motion, facilitating speedy engagement, sensitive control an quick release. The gun can be lit an flames adjusted with or without the wire feeding, thus eliminating the was

NEW

U. S. No. 1 Anti-Friction Bearing

Hand Milling Machine

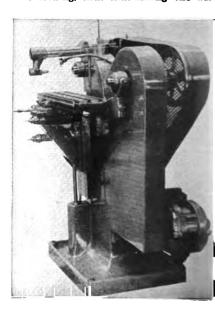
The New U. S. Hand Miller is particularly adapted to high speed light milling operations. Vertical and horizontal feeds.

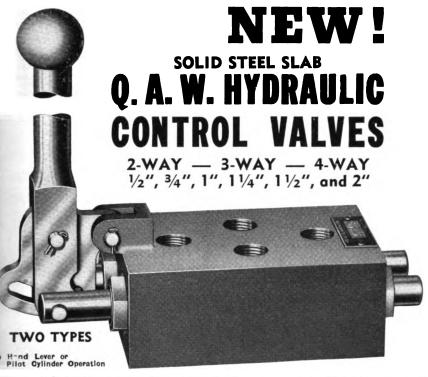
Improvements: Heat treated chrome nickel steel spindle, Timken bearings, Ballbearing countershaft, V-belt drives, 6 Spindle Speeds up to 1592 R.P.M., providing efficient use of small end mills.

Write for full details.

The UNITED STATES MACHINE TOOL Co.

1954 W. 6th St. Cincinnati, Ohio





For 1000 Pounds Working Pressure For 2000 Pounds Working Pressure

Sizes including 1" available in heavy bronze forged housing recommended for water and corrosive fluids. All sizes available with housing machined from solid steel slab recommended for oil or soluble oil solutions. As one user says—"These Hydraulic Valves can take



Representative in England: Gaston E. Marbaix, Ltd., London,

NO METAL-TO-METAL CONTACT

Built on the Q.A.W. principle of No Metal-to-Metal wear in the valving action, Chrome Nickel plungers, short travel, and balanced action, these new valves offer extremely long life in hard service. In spection and re-assembly in a few minutes.



Write for complete new catalog of Air and Hydraulic Valves, "1 M" (key)

Midwest Cutters

for every kind of cut

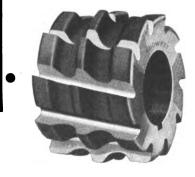


CORRECTLY designed to cut freely, eliminate chatter, and provide ample chip clearance. Made from carefully selected steel and expartly heat-treated to take maximum number of cuts between grinds at high speed.

Send for Ostalog No. 14-M showing complete line of Midwest standard and special Milling Outters and End-Outting Tools.

Midwest Tool & Mfg.Co.

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Midwest Special Form Milling lene general can be emply lene supply.

of wire during adjustment. No moving

parts are exposed.

The "Majestic" is well balanced and the final adjustment and control oxygen, acetylene and compressed at its made with one movement of the valve handle. Oxygen, acetylene air connections are readily replaced the standard prevailing within the oxacetylene industry. The tool can be supplied with a standard handle in manual operation or adjustable tool in holder for mechanical operation.

The best practice employed in



"Majestic" Metalayer

oxacetylene industry for efficient mixing and safe handling of the oxygen and acetylene has been incorporated in the mixing device in this tool, assuring safe operation with an ample supply of oxygen and acetylene available at a pressure below 15 lbs. per square inch in accordance with the Underwriters Rul-Notwithstanding the increased rate of wire melted and atomized, the final deposit approximates the fine grain obtained with tools of smaller capacity. The "Majestic" operates with compressed air at 55 to 70 lbs. per square inch de-pending upon the metal and size of wire, and with oxygen and acetylene at from 8 to 15 lbs. per square inch depending upon the metal and size of wire. Any medium pressure type acety-lene generator of an approved design can be employed for the source of acety-

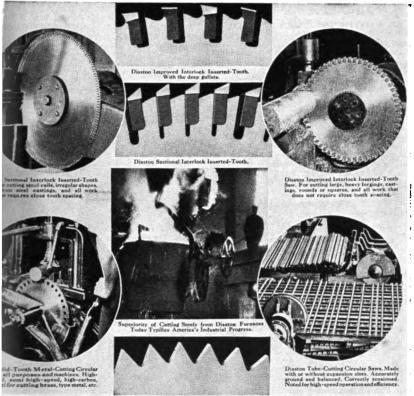


Diagram Hat Some designed for high-speed sorring of hat metals. Teeth stilled, not punched.

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SSTON METAL-CUTTING Circular Saws

Manuals: "Circular Bows", "Band Saws", Hank Saws", "Files", Write address below, stip and mail to Disease, '91 Tecony, Phi'ndelphia, U.S. A.

Air-O-Chek Air Valve

An air valve the design of which is a radical departure, both in principle and manner of operation, from the conventional type of hand-operated air pressure valve is found in the "Air-O-Chek" All-Purpose Air Valve now being marketed by Air-Way Pump & Equipment Co., 623 W. Jackson Blvd., Chicago, Illinois,

The valve, illustrated herewith, is sturdy and simple, yet mechanically highly efficient. All operating parts are shielded within the valve and air hose. There are no protruding buttons or external control levers of any kind, and no packing glands. The ball and socket joint with actuating trigger stem is a mechanical feature said to be found only



Air-O-Chek All-Purpose Air Valve

in the Air-O-Chek. All internal parts are free floating and may be removed for servicing simply by unscrewing the threaded nozzle head.

The Air-O-Chek is made of solid a stock throughout, brass and states steel, and is built to precision standard. The valve is always ready for use. It a quires only a slight pressure of the state of th



View Showing Operating Mechanism

thumb and hand at the head of walve to flex the hose for instant release and control of air, in any volument velocity. Positive shut-off is effect instantly by releasing the hand presure or dropping the hose.

sure or dropping the hose.

The Air-O-Check Valve is available with Tip No. N1 in ¼, ¾ and ½-i sizes. Extension tips, also available, a ¼-in. flat, ¼x3 in., ¼x4 in., ¼x5 in.

and 1/4 x10 inches.

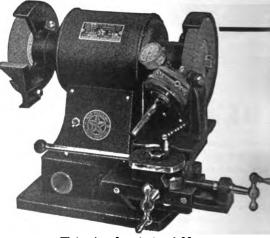
"Tantaloy" Hard-Cutting Alloy

"Tantaloy" is the trade mark of a ne hard cutting tool and wear resisting alloy developed by Fansteel Metallurgical Corporation, North Chicago, Illinois.

Grinds 81 SIZES OF Drills

No. 31 to 1/2"

This Star Precision Grinder puts drill grinding on a production basis. Its simplicity and accuracy saves as high as 50% on drill costs and insures uniform accuracy that guarantees perfect holes and increases production.



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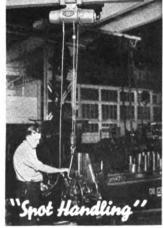
The Zip-Lift is a small electric hoist designed especially for in machine shops, etc. It costs but a little, pays for itself a short time by relieving trained operators of fatigue—by eping machine tools busier . . . by getting more production t of your present equipment. Mounted on a hook, jib or

lley, this new machine tool accessory makes old-fashioned ain blocks obsolete.

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earn how the Zip-Lift is saving money in hundreds of ma-nine shops. Take advantage now of the economies it makes sossible for you. Ask us to send you a copy of Bulletin H-2. ddress the Harnischfeger Corporation, 4535 West National venue, Milwaukee, Wisconsin.

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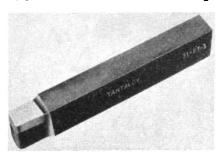
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lease send, without obligation, a copy of Bulletin H-2 which explains money saving with the Zip-Lift.

Company .

is a general purpose hard metal ordin-arily used as a tip which is brazed to a steel shank to form a cutting tool.

Containing tantalum carbide, Tantaloy possesses the characteristics of a high



Tantaloy, a tantslum carbide alloy of unusual toughness, is brazed to steel shanks, making cutting tools of high durability for severe service such as interrupted cuts, heavy feeds, and varying hardness of metal.

degree of chip slippage which resists the development of crater by the chip action. When regrinding, Tantaloy tools require very little metal removal, thus decreasing the grinding time and in-

creasing the useful life of the tool A outstanding characteristic is toughte making Tantaloy-tipped tools highly ficient for service ordinarily regarded severe, such as interrupted cuts hes feeds, varying hardness of metal, or to mounting essentially rigidity.

Tantaloy-tipped tools are available all standard lathe, boring mill and to ret tool sizes and the metal is also ava able in tips which may be brased boring bars, counter boxes, or spectools. Tantaloy is recommended igages, lathe centers, centerless grind rests, wearing surfaces, and the gene field of application of abrasion and of rosion resisting metal.

Finnell 82-X and 84-X Electric Floor Cleaning Machines

accumulations of dirt, grease, metal shavings, and so on, be removed from floors of wood, we blocks or cement in industrial plants the use of the 82-K or 84-K Elect Floor Cleaning Machines which ha been placed on the market by Fins System, Inc., 999 East St., Elkhart, D Water or solvents are not required connection with these machines in ord

IT'S PRECISION BUILT .the C-O 21" Sliding Head Drill

Here's a typically accurate, flexible, yet larger C-O Drilling Unit for high production drilling of large holes. Self-feed and back gear attachments provide a wide range of speeds and feeds.

Vertical Motor Drive—eliminates unnecessary pulleys, idlers, twist and turn belts, reducing wear and vibration; cone pulleys are dynamically balanced, a fiexible coupling inserted removes vibration in the drive shaft. Two Timken Roller Bearings in the Spindle Quill at the top and bottom, provided with a screw adjusting collar for take up. Annular ball bearing in the motor cone pulley, and ball bearing motors. Positive type power feed is controlled by a push knob.

Canedy-Otto Drills, are always "Ready For The Job".

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The very low price of H&G Insert Chasers, together with the most extraordinary wearing qualities, result in much lower chaser costs per thousand pieces.

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The very simplicity of this tool in which worn chasers may be replaced by new with only a few minutes of lost production time and eliminating the necessity of making adjustments, naturally results in higher net production.

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style imm is equipped with improved internal trip for shoulder threading such as for spark plugs.



for hand turret machines



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to remove accumulations of grease edirt.

The machine consists primarily of heavy duty electric motor transmitted power through worm gears of spatial bronze to two brushes which rotate in a horizontal plane. Two wire scarifying brushes are employed, set into brushes which are interchangeable. The rotating parts of the mechanism opensations



Finnell Electric Floor Cleaning Machine

in oversize Timken roller bearings and the worm gears, together with a hardened, ground and polished nickel steel worm, are housed in a leak-proof gear case. The two brushes rotate toward the center of the machine, producing balanced operation even under extreme conditions.

The brushes are available in five standard sizes of steel wire to suit various floor conditions. Each is refiliable when worn, the plates being returned to the manufacturer for this purpose. Tampico or Palmetto fibre brushes can be used in addition to the wire brushes if desired.



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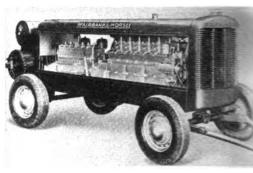
Brushes of 11-in. diameter are used, the total brush spread being 22 in. on each machine. A 1 h. p. General Electric motor is used on the No. 84-X machine, the No. 82-X machine employing a ¾ h. p. motor. Fifty feet of 14 gauge two-conduit rubber-covered cable is supplied with each machine.

Fairbanks-Morse 210-c.f.m. Diesel- Powered Air Compressor

Fairbanks, Morse & Co., 910 S. Wabash Ave., Chicago, Ill., has announced a new selfcontained, Diesel-powered, 210c.f.m. air compressor, available with several types of portable and semi-portable mountings,

for a wide range of service applications. This new compressor combines the economy and dependability of the F-M Model 36-A Diesel with the superior design features of a proved air compressor, making available a compact, lightweight unit that offers maximum efficiency and absolute reliability under all working conditions.

Through the proper application of modern principles of engineering design,



Fairbanks-Morse Diesel-Powered 210-c.f.m. Air pressor with Pneumatic-Tired, Four-Wheel Per-Mounting

the compressor unit has been kept ligin weight and small in size, contributing to its portability. Ample bearing surfaces and proper lubrication make posible a long trouble-free life. The water cooling system assures thorough an uniform cooling in any climate and under any condition. Low upkeep expense results from the employment of refinements of proved automotive engineering.



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The compressor is designed to operate at full engine speed, permitting direct-connection to the engine without reduction gears or belts and without sacrificing engine horsepower through reducing

the rated speed.

The F-M Model 36-A, four-cycle, six-cylinder, medium-high speed Diesel engine offers true Diesel economy with necessary flexibility. Its compact, clean-cut appearance is outward indication of inbuilt sturdiness to withstand hard usage. Reliability results from simplicity of design with few moving parts, absence of delicate mechanisms, and the use of simple adjustments where any are required. Durability is obtained by the generous proportioning of parts in stress and use of only highest grade materials. The engine is designed to permit easy inspection and servicing.

The new Fairbanks-Morse Diesel-powered air compressor is available with several types of mounting: wooden skid, steel wheel, solid or pneumatic rubber tired wheel, four- or two-wheeled trailer,

and motor or railway truck.

Baldor Grinder for Carbide Tools

The Baldor Electric Company, 4380 Duncan Ave., St. Louis, Mo., announces

the development of a grinder, designer for the one purpose of sharpening cabide tools. This grinder is equippe with two wheels, one for roughing ope

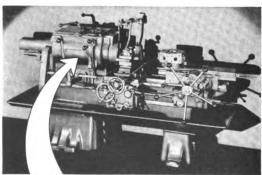


Baldor Grinder for Carbide Tools

ations and one for finishing operation and is powered with a $\frac{1}{2}$ h.p. reversible motor so that either right hand or leithand tools may be sharpened with the wheel always rotating towards the cutting edge of the tool. The grinder is

PULLMORE CLUTCHES

In Gisholt Turret Lathes Two single-type Pullmore Clutches, remain



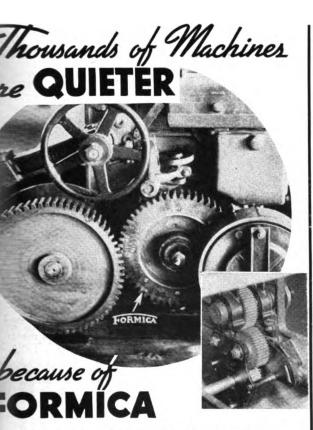
Two single-type Pullmore Clutches, running in oil, are used in the spindle drive of Gisholt Universal Ram Type Turret Latin for changing from high spindle-speed rung to low, or low range to high, instantly without shifting sears or stopping the spindle. Pail more Clutches are used also in the caurlage of Gisholt Heavy-Duty Turret Latines.

Pullmore Clutches are used because the operate easily; pick up and release load quickly and smoothly, stand up in continuous service. They are reliable, compact, damable meet the design and service requirements of automatic and semi-automatic industrial mechinery. Pullmore Clutches are made in single and double types, for operation in oil or dry, in many sizes for transmitting up to 175 h.p. Investigate. Write today for complete information. Ask for the Pullmore Blue Book.



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designed to take a silicon cup wheel on the left hand side and either a silicon cup wheel or a diamond cup wheel on the right hand side.

Standard equipment includes the fol-

lowing items: tool rest tables 10x3½ in.; protractor at each end of the grinder to indicate the angle of the tool table; light which may be swung over either wheel; tool supports attached to the tool rest table. Wheels are optional. a chuck, but fits loosely in the socks so that the blows delivered by the hammer can rebound in the same manns as blows delivered by a hand hamms. This method of holding the start drill



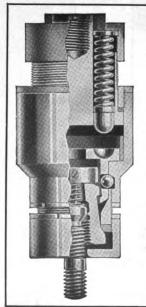
Wodack "Do-All" Combination Electric Drill and Hammer

Wodack "Do-All" Combination Electric Hammer and Drill

With the "Do-All" Combination Electric Hammer and Drill shown in the illustration, holes can be drilled in concrete, brick, and stone as well as in metal and other substances. The tool is made by Wodack Electric Tool Corporation, 4627 West Huron St., Chicago, Ill., and is especially adapted for maintenance work in the factory and similar uses.

The start drill used in drilling concrete or stone is not held as tightly in the manner as a twist drill is held in has advantages, the only disadvantage being that the drill can be dropped out of the hammer or inadvertently shout, with the possibility of hitting person or breakable object. The disadvantages referred to has, however, becaliminated in this drill by the use of a retainer.

The retainer is made entirely of molded rubber and fits over the nose of the hammer in such manner as to hold the drill in place with just the right amount of play for rapid drilling or cutting. It also prevents grit from getting into the socket in overhead drilling. The retainer is standard equipment on all Wodack electric hammers.



TITAN STUD SETTER CONTROLLED DRIVE Assures Perfect Setting

The Titan Stud Setter has a safety clutch which controls driving power.

The Titan is positive in driving and automatic in releasing, thus making it possible to set the studs to any predetermined degree of tightness.

When the studs are driven to the specified tightness, the drive is automatically released and the tool may be removed without fear of mutilating or distorting the threads.

The great capacity, speed range, utility, and safety of this production tool make the Titan Stud Setter a profit-earning tool wherever it is used.

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This machine operates from your plant air line, and is one of numerous models built to produce fast, neat marking on metal parts. Hi-Duty marking machines may be had for practically any marking operation, and we will be glad to make recommendations upon receipt of your inquiries. Send prints or samples of parts to be marked, showing lettering and location, also state required production.

GEO. T. SCHMIDT, Inc.

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Tornado Industrial Vacuum Cleaner

The Breuer Electric Manufactura Company, 843 Blackhawk St., Chicag Ill., announces important improvement in its line of portable Heavy Duty I dustrial Vacuum Cleaners and also To nado Portable Electric Blowers for



Tornado Industrial Vacuum Cleaner

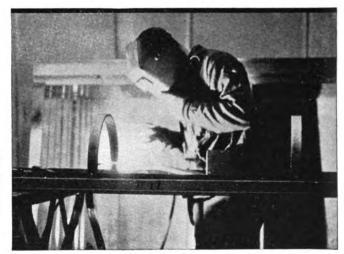
moving dust and dirt from motors, mechinery and industrial plants and processes.

The Tornado Portable Cleaner, Mod 112, is now furnished with a new doubsize dust bag.

Tornado Blowers, Model 6A and 8 are now built with enclosed ball bearing assembly and screen gauge over the encor motor housing to prevent excessive dust and dirt from getting into the motors.

Interoval Gas-Fired Steel Treating Furnace

The Interoval furnace for heating ster for hardening, now being marketed by Bennett Insured Steel Treating Company, South St., Newark, N. J., embodie a single chamber with a cylindrical oral interior so constructed that heated products of combustion can not contact the piece in process. The Interoval furnace is 32 in. high and 20 in. in diametr.



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Send a free copy of Bulletin 314 and easy payment details on the Lincoln Machine Shop Welder.

Name Position

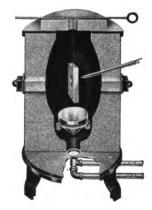
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outside. The heating chamber is 14 in. high by 9 in. wide at the center and 7 in. wide at the top. The entire furnace



Interoval Gas-Fired Steel Treating Furnace

weighs 550 lbs. and is shipped complete with burner.

To heat work in the Interoval furnace, the pieces are suspended in the furnace by means of an attached wire and heated entirely by radiation. A disast the base of the heating characteristic and the base of the heating characteristic and the base of the heating characteristic and the products of combustions of the second walls to finally be released the upper opening. Due to this second of firing, products of combustions of firing, products of combustions of the upper opening, as a consequence, a mum of effect upon the furnace want reducing upkeep cost to the mumin.

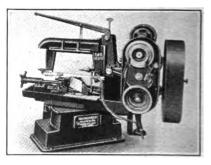
The cone-shaped brick or deflector at the lower part of the furnace is supported by three silicon carbide inserts. The super-imposed brick is provided with small standards to allow an at space between the two. The Interoval is preferably gas-fired and will reach and maintain high speed temperature in remarkably short time and small expense, regardless of the fuel employed. The internal construction of the furnace is such that tools of straight carbon steel, Hi-Carbon Hi-Chrome and high speed steel may be heated from minimum to maximum temperatures without danger of loss in size, pitting or oxidation.

The pyrometer opening in the Interoval furnace is so situated that the fire

THE NEWEST DEVELOPMENT IN METAL SAWING MACHINES

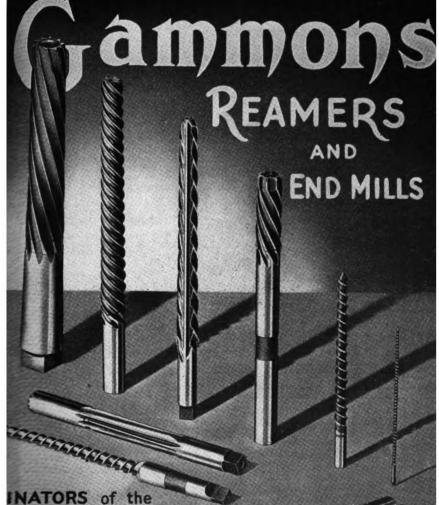
CAPACITY 16" x 6" x 10"

Swivels on base for angular cuts—three speeds by V-belt—saw guide of parallel type—saw frame has 4 large, self-aligning shoes, unaffected by excessive tightening of saw blade—vise graduated to 45°—feed is compensating type.



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end of the pyrometer can be located at close proximity to the piece being heated. Two 5x3-in. openings are also provided directly in line on two sides of the furnace so that end mills, nut taps, reamers and similar tools may be heated at the ends only, leaving the shanks in the original soft state. The openings are closed with refractory plugs when not in use. A pure cast nickel plate 22 in. long by 5 in. wide is furnished which, when both refractory plugs have been removed, can be placed through the openings so that small pieces can be

inserted through the front and force through the rear into the could medium.

The Interoval furnace may immed ately be converted into a lead, cyang or salt bath furnace by removing the two top bricks and one of the miplugs, leaving an opening which acts a flue. A pressed steel pot 6 in idiameter and 12 in. deep may be use for this purpose.

If desired, pyrometer equipment will rare metal fire ends and protecting tubcan be supplied, also electrified blowequipment mounted on a compact sing

base

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219 E. Second St., Cincinnati, Ohio

IN STEP WITH METAL CUTTING PROGRESS





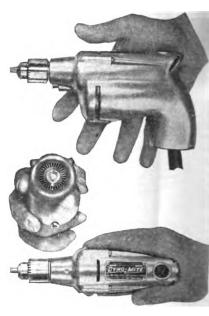
Precision-made tape in a wide variety of styles, in CARBON ALLOY and HIGH SPEED STEEL, for economical thread cutting.

THE WINTER BROTHERS CO. Wrentham, Mass. Detroit, Mich.

Division of the National Twist Drill & Tool Co., Detroit, Mich.

Millers Falls "Dyno-Mite"

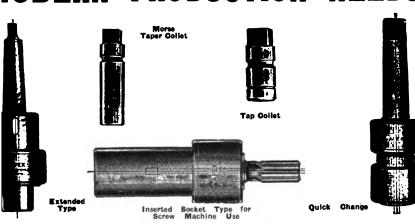
The illustration shows the "Dyn-Mite"—a streamlined ¼-in, products



Millers Falls "Dyno-Mite"

drill which has been developed by Millers Falls Company, Greenfield, Mass The features of the tool are its streamlined body, its extreme light weight of only $2\frac{1}{2}$ lbs., overall length of only $\frac{6}{2}$ in., width of body of $2\frac{1}{2}$ in., and the ease with which it is controlled with one hand. Strictly a production took the Dyno-Mite will drill $\frac{1}{4}$ -in. holes in

LOATING TOOL HOLDERS MEET IODERN PRODUCTION NEEDS



esa tools compensate for machine spindle misalignment. Apex pating Holders are designed to permit tools to follow holes on a true e regardless of irregularities in alignment of machine spindle and wk. Taps produce threads with uniform pitch diometers. Reamers lish holes true to size.

ckets are furnished for Morse Taper or straight shank tools. Shanks

e furnished in any toper or straight dineters to fit any size or style of machine indle, or with adapter shanks to General otors or Chrysler Motor standards.

pex Floating Holders are also furnished ith quick change chucks so that collets ir Morse Taper or straight shank tools nd collets for taps may be quickly hanged.

he Apex Machine & Tool Co.
hird & Madison Sts.
Dayton, Ohio

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APEX

cost reducing PRODUCTION
• TOOLS • -

steel continuously at a speed which is said to tax the staying powers of any operator. Its size and weight give perfect hand control with a minimum of fatigue. The small girth and streamlined shape permit its use in extremely close quarters.

The die cast aluminum shell houses a powerful motor with a ball bearing armature running in a horseshoe field. The driving mechanism comprises a train of quiet, powerful helical gears made from heat treated chrome molybdenum steel. The spindle runs in oversize oilite bearing and thrust is taken by a ball thrust bearing. A copious flow of air insures cool operating temperatures. Control is through a double pole fully-enclosed switch.

The no-load speed is 1600 r.p.m. and the full-loaded speed is 875 r.p.m. 1.8 amperes are consumed under full load. The motor is universal for D.C. or A.C. up to 60 cycles and either 110 or 220

volts.

Ohio Circular Table

The circular table shown in the illustration, designed for use with milling machines, slotters, die sinkers, shapers and similar machine tools, has been placed on the market by Alfred A.

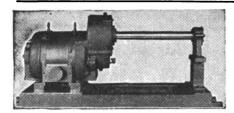
Troyke, 28 W. Second St., Cincinns Ohio. The tool is made in two siz 12 in. and 15 in., these sizes representing the turntable diameter. The overheight is 4 in., the hole in the cen is $1\frac{1}{2}$ in. in diameter and the tong strips are $\frac{5}{2}$ inch.

The turntable rests on a wide



Ohio Circular Table

bearing 11½ in. in diameter. A lathrust collar holds the table down a provides means for taking up wear. revolves on a center stem running in adjustable tapered bushing. The taking graduated in degrees and an adjustable pointer is provided for setting. I worm wheel is of ample size and meare provided to take up wear between the worm and wheel. The turntable revolved by means of an aluminalloy hand wheel, one revolution which moves the turntable four orgrees. A lock is provided to hold table stationary for straight milling.



CONE PULLEY DRIVES

● These drives make your machines independent of line shaft location or operation. They often increase production as much as 50%. The 3 bearing drive shown above is the basis of all of our designs. It can be furnished for floor mounting, or, with our supports, for mounting directly on lathes, screw machines, shapers, millers, and other tools. Furnished with heavy duty antifriction bearings thruout, it maintains accurate alignment and delivers a smooth flow of power under all operating conditions.

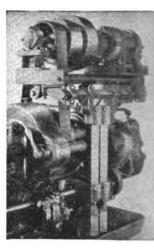
Easily installed.

Reasonably priced.

THE PRODUCTION EQUIPMENT CO.

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Cleveland, Ohio gitized by Google



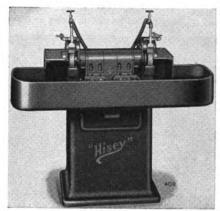
REAR VIEW OF SCREW MACHINE DRIVE

The

NEW Hisey

HISEY Wet Grinders are made as follows:—

Two Wheel Wet Grinders One Wheel Wet Grinders Combination Wet and Dry



Consider these *Practical Udvantages* of Hisey Grinders

Constant stream (adjustable) of coolant directly on the work.

Elimination of dust collecting system.

Self Priming Pump.

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V Belt drive to spindle and pump.

Universal adjustment of nozzle.

Large flushing plate.

Ball bearing spindle sealed against water and dirt.

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Literature on request.

HISEY Wet Grinders are made in various types and sizes for 10, 12, 14, 16, 18, 20 and 24 inch diameter grinding Sixteen inch machines and larger are made in single wheel type only. Smaller machines are made in single wheel, two wheel and combination wet and dry types. Pump is self priming and bearings are never under water. Same motor drives pump and grinding wheels thru V belts. Machines can be furnished with or without motor, as any available motor may be used. Wet Grinders eliminate the necessity of a dust collecting system as required by many States as the water carries with it all dust and grit.

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Electric DRILLS ... GRINDERS ... BUFFERS

Sellers 5-In. Horizontal Boring, Drilling and Milling Machine

The illustration shows the No. 504 Type A 5-In. Floor Type Horizontal Boring, Drilling and Milling Machine now being built by Wm. Sellers & Company, Inc., 1700 Hamilton St., Philadelphia, Pa. This thoroughly modern tool is designed to meet the most exact-

Sellers 5-In. Horizontal Boring, Drilling and Milling Machine

ing requirements of the metal working industries.

The floor plate upon which this machine is constructed is 12 in. thick and can be furnished in standard sections either 5x10 ft. or 5x12 feet. The floor plate is accurately machined at the joints and the sections are bolted and keyed together with close fitting steel keys and dowels. For standard construction, the T-Slots run lengthwise of the section. They are machined on 12-in. centers and take 1½-in. bolts. Between the T-slots are rows of cruciform holes T-head bolts. The floor plate is of special alloy iron with a hard, dense, long-wearing surface.

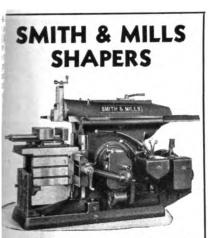
The bed measures 44 in. across the ways. The front way is 7½ in. wide and the rear way 6½ in. wide. The column traversing screw is stationary, the nut revolving. The nut is of hard bronze and revolves in preloaded, antifriction bearings. On machines having 16 ft. or more horizontal travel, the column traverse screw is supported and kept from sagging by a tumbler half-

bearing located about midway. Bed ways and column traversing mechanism are automatically and continuously offled by a pressure pump and the bed ways are protected from dirt and chips by bronse scrapers and felt of seals.

The distance across the column ways is 30 in. The front way is 8 in. wide and the rear way 6 in. wide. The column, for its entire height, is of heavy rectangular box section. It is neither tapered nor curved at the back, DOT 15 there any reduction in the size and strength of internal ribbing. The consaddle of the bed. but is of solid, onepiece construction from the top down to the gibs on the bed. The column bearing on the bed is 66 in along the ways and 44 in. across the ways. The head is a complete power unit from

the motor to the spindle and contains the forward and reverse driving clutches, all speed and feed changes, and hand and power traverse to both spindles, head, saddle, and table. The driving motor is mounted on the head, giving the shortest, most efficient and most direct application of power to the cutting tools. All shafts are short, of heat treated alloy steel, multiple splined, and revolve in antifriction bearings. All gears are of heat treated alloy steel.

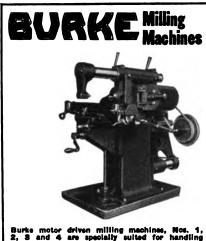
The entire feed and traverse mechanism and driving mechanism are built in units. Each unit is readily removable from the head. Power to drive the machine is transmitted through multiple



Automatic lubrication-forced feed. Multiple lise clutch and brake. Quick feed changes. Firect reading feed and stroke dials.

IITH & MILLS

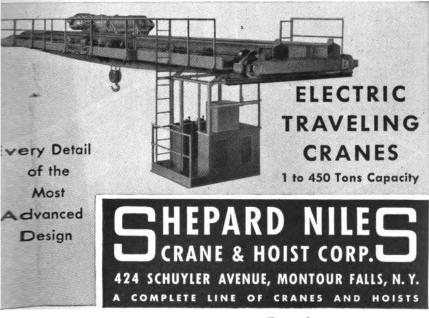
оню



Burke motor driven milling machines, Mos. 2, 3 and 4 are specially suited for handli small, difficult work on a production basis.

Write for complete information.

297 E. 16th St. Conneaut, Ohio



disk clutches, both forward and reverse. The screw feed for the spindle operates with a steady, unvarying feed pressure. The entire head mechanism is automatically and continuously oiled. The head is rigidly clamped to the column from front to back and right to left. Adjustable tapered gibs provide for taking up wear in both directions.

The head is suspended by two counterweight cables so that it can not "cock" on the column when unclamped. The head is guided on the front way next to the cutting tools and the elevating screw is close alongside this guiding way, assuring the most accurate align-ment when milling with the head feed-

ing on the column.

The spindle and spindle bushings are of Nitralloy steel of approximately 750 Brinell hardness. The spindle sleeve is of heat treated steel and has an overall length of 41½ in. Preloaded Timken precision bearings are provided for both the front and rear of the spindle.

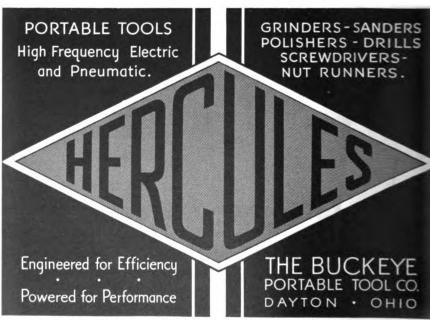
are no overhanging driving gears; the slow speed driving gear is inside of and next to the front main spindle sleeve bearing. When milling, the spindle is clamped direct to the driving flange on the spindle sleeve, making the spindle and sleeve one unit.

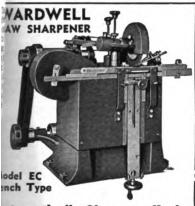
The machine is controlled entirely

from the unit head. The main feed and reverse driving clutch lever is on the free of the head above the spindle where the operator can control the spindle movements with the cutters in full view Speed and feed change levers are adjacent to the clutch lever, which permis shifting gears with one hand and operating the clutch lever with the other Head and column feeds are independent and can be fed simultaneously or alternately.

A directional control lever provides for feeding the spindle in or out of the head without reversing the direction of spindle rotation. When used in conjunction with power traverse, the directional control lever provides for fast power movement of the spindle in or out of the head and eliminates winding the spindle in or out by hand.

A micrometer dial for accurately postioning the spindle is provided on the front of the head. A micrometer dial for final positioning of the head and column is provided alongside the pilot Hand adjustment with a miwheel. crometer dial is provided at the base of the column. As an extra, hand adjustment of the head, including the micrometer dial, can be provided at the base of the column for final positioning of the head from the floor.





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th teeth as fine as 32 to the inch, a speed of 30 to 75 per minute. WRITE FOR CIRCULAR

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CLEVELAND. O.





The main spindle on the 4-in, machine has 24 speeds ranging from 8.8 to 505 r.p.m., and the auxiliary spindle has 14 speeds ranging from 150 to 1500 r.p.m. The main spindle on the 5-in machine has 24 speeds ranging from 5.3 to 334 r.p.m., and the auxiliary spindle on the 5-in. machine has 14 speeds ranging from 100 to 1000 r.p.m. The main spindle on both machines has 24 feeds ranging from 0.0025 to 0.625 in. per revolution. The auxiliary spindle on both machines has 24 feeds ranging from 0.001 to 0.208 in. per revolution.

Limit trips are provided at each end of the spindle, head and column travel. The power traverse is friction clutch driven and acts as a safety device should obstructions be encountered between the limit trips. Electrical equipment includes one 15 h.p. 1750 r.p.m. 3-phase, 60 cycle 220 volt A. C. motor with disktype motor-mounted solenoid brake, magnetic non-reversing starter and push

button control.

Newton Drum Type Milling and Center Drilling Machine

A machine tool that combines the operations of face milling and center drilling both ends of shafts simultane-

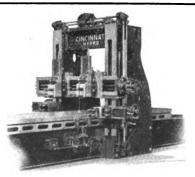
ously has recently been built by the Newton Division of Consolidated Machine Tool Corporation, Rochester, New York. By doing both these operations on one machine, production time and cost have been lowered considerably. This new Drum Type Milling and Center Drilling Machine, as shown in illustration, uses a three-station Universafixture arranged to dwell against indepins while drilling and loading. The cycle of operation is as follows:

1—Loading position is at front of machine. After work is loaded, the operator throws a lever which re-

—Loading position is at front of machine. After work is loaded, the operator throws a lever which reverses the drill spindles that have just finished center drilling at the third station so that they back out and clear the work.

2—The operator releases the indepins, starts the drum in rapid approach, which changes automatically to feed, and both ends of the shaft are face milled. At the conclusion of the cut, the drum again changes to rapid traverse and stop against the index pins.

3—At this position, the operator throws a lever which starts the center drills into feed. While ends of the shaft are being milled and center drilled, the operator is unload.



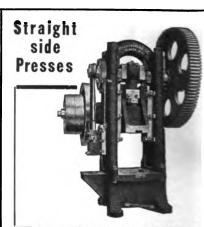
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Pioneers in the riveting field. Head rivets from smallest to %" diameter, ther by noiseless spinning or vibrating ammer method—Sizes to meet all needs—ypes include Vertical and Horizontal ultiple Spindles. rite for literature—and don't forget to

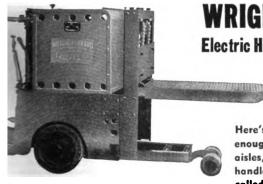
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This 18-inch Band Saw has all the refinements developed for larger "Oliver" Band Saws. Especially effective saw in g sheet steel. Also sprues of soft metal, ply-metal, hard rubber. compositions, etc. Has motor - on -shaft. Operates from light socket. As sturdy, precision-built machine in every detail.

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ing the finished work and reloading. After the holes have been center drilled the cycle is again repeated.

The two milling spindles are mounted directly opposite; one in each heat Each is mounted in Timken roller berings and supported by sleeves have separate adjustment for setting the cut fers to the desired depth. One head bolted in a stationary position, and to other head is adjustable along the bas Both heads are driven from one mounted on a bracket near the form and direct gear connected thru suitareduction gears which are enclosed operate in oil.

Two drill spindles are mounted direct opposite, one on each head. Each



Newton Drum-Type Milling and Center Drilling Machine

spindle has separate motor direct sconnected thru suitable reduction seincluding pick-off gears for chanthe spindle speed. Drill spindles mounted in Timken roller bearings drive is mounted in anti-friction beings throughout.

The drilling feed is obtained hydrically as each drill spindle is mount in a sleeve which is arranged to horizontally by the action of a mydraulic unit mounted on the dheads parallel to the direction of dring feed. The oil for feeding the spindles is supplied by a hydraulic puriety with provision for regulating the rate feed. Provision is also made for relating depth of drilling.

In addition to the milling and draspindles, each head contains a draspindle for driving the work holding ture. This drum feed is also nydrau ally operated, thus giving a wide reof easily adjustable feed rates.

Adjustment is provided for taking on essential bearings for the purposmaintaining proper alignment.

A complete coolant system, inclupump, piping and attachments is vided for supplying adequate amount coolant to the cutters.

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FIG. 1249



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The fixtures consist of two three-sided plates which bolt on each of the drum spindles. Each of these plates is fitted with three Universal chucks arranged to take interchangeable jaws. With this arrangement of Universal chucks and head adjustable along the bed—a wide range of sizes of shafts can be accommodated. Centering of the shafts in fixtures when changing sizes is facilitated by indentors on each head.

This machine requires four motors; one for driving the milling spindles, two for drill spindle drive and one for hydraulic feed motor for driving fixtures

and feeding the drill spindles.

Landis Chaser Grinders

The Landis Machine Company, Waynesboro, Pa., manufacturers of thread cutting die heads and threading machines, announces a line of chaser grinders to replace the outdated Model "Y" and No. 2 Grinders. The new line of chaser grinders consists of three models that cover the entire range of sizes of Landis Chasers, thus making available a machine that is suitable for any condition under which it might be required.

These grinders are all motorized, the grinding wheels being mounted directly on the armature shaft of the motor, thus

eliminating gear or chain drives. Two grinding wheels, one cup and or straight, are supplied as standard equipment. The grade and grain, as well at the size of the wheels used on the grinders, were selected because of the longer life and efficiency in grinding. Wheels that will not burn or damage the chaser in any way are absolutely necessary.

The straight wheel is used for grinding the rake angles of Landis Bolt Chasers where a leadscrew is not used. I rest that is adjustable to any angles provided to facilitate this operation. The straight wheel may also be used for msicellaneous grinding. The cup wheels used for grinding the lead and raken angles of all pipe chasers and bolt chasers when the thread is to be cut with the use of a leadscrew.

The motors used in these grinders are of the ball bearing, continuous dutype. A ball thrust bearing on the armature shaft assumes the thrust load of grinding chasers on the face of the curwheel.

The Model "O" is a small machine designed primarily for the grinding of Landis Chasers for the smaller sizes of Landis Die Heads. The small size of the grinder makes it an ideal machine to departmental use where a number of Landis Die Heads are employed. The

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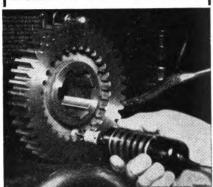
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This machine quickly stamps details and serial numbers into name plates.

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CUT SAW COSTS

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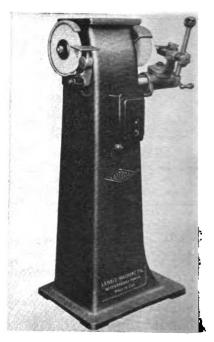
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COVEL-HANCHETT CO.
BIG RAPIDS, MICHIGAN

use of the Model "O" Grinder in deparments eliminates the necessity of having a central grinding room and the waste of time that occurs by carrying the chasers to and from the grinding room.

The No. 1 Grinder is a heavier machine and may be used for grinding all Landis Chasers up to 1% in. wide This machine replaces the former Mode "Y" Grinder and is said to be an ex-



Landis Model "O" Chaser Grinder

cellent machine for use in tool rooms for the production grinding of Land's Chasers.

The No. 1½ Grinder is an extra-heavy duty machine designed for grinding the largest Landis Chasers under the most severe production conditions. This grinder is the only one of the three modes in which means are provided for the use of a coolant on the cup wheel to reduce heat generation and, consequently, to eliminate the possibility of burning the chasers. A centrifugal pump, generated in the coolant of the machine, provides a steady flow of coolant.



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Shears, Notches and Bends a 2" x 2" x ½" angle iron in one minute flat.

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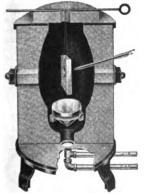


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these openings allowing continuous feeding and heat treating of small parts. Convertible into lead, cyanide or salt bath furnace accommodating 6"x12" pot.

BENNETT INSURED STEEL TREATING CO.
130 SOUTH ST.
NEWARK, N. J.



Write for Your Copy from the large reservoir to the grinding wheel.

The Model 1½ Chaser Grinder is also the only grinder in this line that employs a traversing table at the cup wheel end. The Model "O" and the No. 1 Grinder employ a new method for infeeding the chaser and passing it back and forth across the face of the wheel. The swivel head in which the chaser is gripped for grinding is mounted on a cylindrical base. The cylindrical base operates on a spindle and is fitted with a long handle which is used to swing it in an arc parallel to the wheel. A



The Western Tool & Mfg., Co.



Landis No. 1 Chaser Grinder

feed screw is provided through the spindle to infeed or withdraw the swin head.

The infeed screw and the bearings of which the swivel head base operate at effectively protected from the possibility of grit entering the sliding surfaces. sliding bushing in the machine bed at tends into the cylindrical base and completely covers the spindle and feed services when the swire head is withdrawn to the position when it would operate with a new grinding the would operate with a new grinding the surface of the position when it would operate with a new grinding the surface of the position when it would operate with a new grinding the surface of the position when it would operate with a new grinding the surface of the position when it would operate with a new grinding the surface of the position when the surface of the s

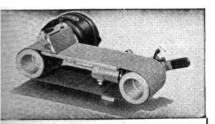
Set-up Time Becomes Production Time Walker Magnetlo Chuck lave from 20% to 50%

Walker Magnetic Chucks save from 20% to 50% in chucking labor by eliminating slow-acting jigs and fixtures for metal removing operations on lathes, shapers, drills, presses, planers, grinders, etc. Write for catalog W 3.

O. S. WALKER CO., INC. WORGESTER, MASS.



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Designed for maximum rigidity, this saw is accurate and efficient in operation. Automatic trip stops the machine on completion of the cut. Automatic relief of the saw blade on the non-cuting stroke is also provided. To make a clean and compact assembly, the coolant pump is mounted inside the base. Capacity is 6"x6", with 10"x14" blades.

L-W CHUCK CO.

20 N. St. Clair St.

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232

wheel on the machine. As the wheel wears and the swivel head is advanced, the heavy grease will gradually be forced out through all joints. The action of the grease coming out eliminates the possibility of grit or dirt working in.

An additional feature of this fixture is an adjustable stop for limiting the length of travel of the swivel head, parallel to the wheel. Although the usual practice is to grind the lip rake angle of Landis Chasers by hand on the straight wheel, it is now possible to grind the angle of the cup wheel, if desired.

the angle of the cup wheel, if desired.

A new type of swivel head is employed on all Landis Chaser Grinders. The

chaser clamping screw contacts the chaser on the dovetail surfaces in the same manner as the chaser clam on a die head, thus providing a right and secure support to the chaser and its suring that the rake and lead angles as



Landis No. 11/2 Chaser Grinder

accurately ground. Rake and lead angle are said to be the same when the chas is clamped in the die head. The swin head is fully graduated so that any degree of rake and lead angle that is required may be obtained.

Although a Landis Chaser Grinder not absolutely essential to the propoperation of a Landis Die Head, the acuracy with which the chasers are ground will be reflected both in the quality of the thread produced with the die head and in the chaser life.

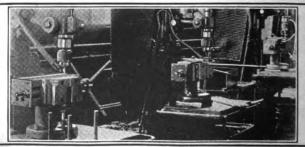
Improved They are made in Anderson the following sizes: Balancing Ways Greatest Capacity Distance Swing No Leveling in lbs. Between Standards Required A simple 20 in. in. 1,000 40 30 in. in. 2,000 60 30 in. 2,000 device for in. balancing, 72 in. 66 in. 5,000 96 in. 88 in. straighten i n g 10,000 and trueing.



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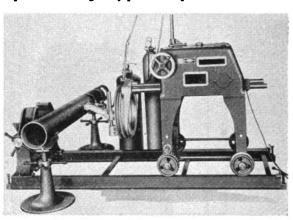
American Machine and Metals, Inc.
100 Sixth Avenue

New York

N. Y.

Oster No. 222 Torch Cutting Machine

The Oster Manufacturing Co., 2061 East 61st St., Cleveland, Ohio, has announced an improved model torch cutting machine to supercede their original Model No. 212. The new No. 222, which duplicates in design any pattern required



Oster No. 222 Torch Cutting Machine

for pipe welding jobs, does not require the use of cams, templates or special fixtures and it is claimed that the surface produced has the appearance of a lathe tool cut.

The cutting torch is guided by a mechanism which duplicates the motion of a torch held in the operator's hand. It will cut pipe from 2½ to 12 in., making tees, reducing tees 90 deg., branch reducing tees 45 to 90 deg., making elbows, miters, Y's and blunt bull plugs, as well as cutting holes.

The case containing the generating mechanism is mounted on four least which are equipped with flanged when running on a track. The pipe is certered in a vise and supported on reliepipe rests (if the length requires the additional support), for straight cutting for butt or tee welding. The adjustable torch carrier is then brought into the

proper position. If a hole is to be cut in the pipe, it is placed at right angles to the torch carrier on the roller pipe rests.

The settings of the generating mechanism are regulated by positioning a rotating beam or lever which operates a reciprocating slide. The beam are marked to show the settings for the various sizes and types of curs so that it is a simple matter for the operator to make correct setting The reciprocating slice in turn, controls the movement of an oscillating lever which reproduces the movement 11 the torch carrier. The method of imparting movement to the rotaling lever is through

hand wheel, located at the side of the generating mechanism case, which also produces the drive for rotating the torch carrier ring around the pipe. The operating hand wheel is located conveniently for the operator where he can see the work clearly as it is being done.

The improved model is said to have been greatly simplified and, consequently, creates a greater saving in time over the methods employed by the original machine. Floor space required, in-



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BULLETIN A

It gives a clear picture of WALES HOLE-PUNCHING and NOTCHING DIES and STRIPPITS—Their uses—and the savings they make possible—write for your copy.

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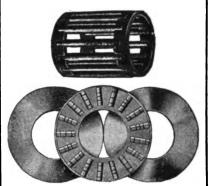


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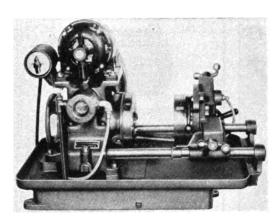
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No. 512-A "Tom Thumb" Portable Pipe Machine

cluding the track unit, 3 ft. 4 in.x9 ft. Net weight, 3000 pounds.

No. 512-A "Tom Thumb" Portable Pipe Machines

The line of ½ to 2-in. "Tom Thumb" Portable Pipe Machines, product of The



Oster Manufacturing Co., 2018 East 61st St., Cleveland, Ohin has been rounded out by the addition of the No. 512-A.

Equipped with a new type of die head which is integral with the carriage, the threading de are more rigidly supported an their life is greatly lengthened In addition, more accurate work is produced. The de head is of the front cutting type which, together with the michine's "close-grip" from chuck, makes it possible w handle pieces as short as 1; without using a nipple chuck. The size setting mark are on top of the head, when they are plainly visible is easier, more accurate setting

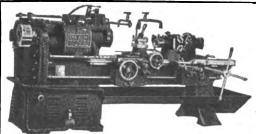
An internal oiling system to the dies and cut-off tool provided. A flexible hose arries the oil from the oil pump

to the intake valve in the die head, the flow of oil being controlled by a two-sign thumb valve conveniently located for the operator. The holder for the cut-direaming and chamfering tools is operated in a heavy block by a large bill crank. This rectangular tool holder, amply supported, eliminates twist and posible breakage of the tools. The cut-of

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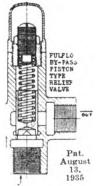
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reaming and chamfering tools are said to be of heavier construction than those ordinarily used on machines of the "Tom Thumb's" capacity.

The steady rest, which is necessary in the cutting-off, reaming and chamfering operations, is very solidly supported by a heavy rectangular block and is oper-ated by a ball crank. The studs carrying the die head and carriage are longer than those used in the other models and are supported at the ends for greater rigidity. Dimensions are as follows: overall length, 34 in.; width, 21 in.; height, 24 in., and net weight, 375 pounds.

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Two sizes are available in 3/16-

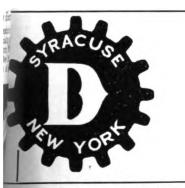


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A precision-built line of motorized speed reducers—made in 16 different types—1/20 to 7½ H.P.—a reducer for every application.

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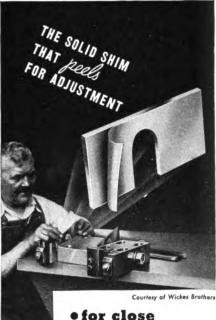
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capacity—the No. 362 and No. 362H. The No. 362 has an "On" and "Off" switch mounted in the rear end bell. The No. 362H has an automatic pistol-type handle in which a fully-enclosed double-pole switch is mounted. Two sizes are also available in ½-in, capacity, the No. 462 being similar to the No. 362H.

Dremel Model 2 Moto-Tool

The Model 2 Moto-Tool illustrated here, product of Dremel Manufacturing

SAVE

and prevent accidents by using the Red E Safety First Belt Stick for throwing belts on and off moving pulleys.

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Model 2 Moto-Tool with Universal Moto-Tool Stand and Shaping Table

of the machine is 27,000 r.p.m. and it weighs 13 oz. Although larger and heavier than the Model 1 machine this tool is still small enough and light enough to fit easily into the hand.

The tool is 1-11/16-in. diameter by 6% in. long and is powered by a motor which consumes about 60 watts. The

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mechanism is housed in a sturdy, shockproof bakelite housing. A wrenchless universal twin cone collet-type chuck is universal twin cone collet-type chuck is employed, located at the end of an oversize, hardened, ground and polished shaft running in large oilless trouble-proof bearings. A finger grip which is an integral part of the body of the machine makes it possible to hold the tool close to the chuck. Commutator brushes are large, for long wear, and can easily be replaced. A hanger is provided to hang the tool up to keep can easily be replaced. A hanger is provided to hang the tool up to keep it clean and protect it from injury.

Among the accessories available is a Universal Moto-Tool Stand to which the Moto-Tool can be anchored so as to leave both hands free. The tool can be adjusted to any angle by means of a ball joint, fastened with a wing nut. The stand is of cast iron and neatly finished.

Another accessory is the Shaping Table which can be used with the universal stand for routing and grinding flat pieces to any desired shape. table can also be used without the stand for grinding or routing to a predeter-mined depth. The Moto-Tool is shipped complete with a universal chuck, 1%-in. collet and No. 1-B52 wheel point.

An All Purpose Air Velocity Meter



Instantaneous **Direct Reading** No Timina No Calculations

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Holo-Krome No. 22 Socket Screw Wrench Ser

The Holo-Krome Screw Corporation Hartford, Conn., has brought out socket screw wrench set—the No. 22-



Hole-Krome No. 22 Secket Screw Wrench Se

which includes nine Holo-Krome "Fi Hard" surfaced socket screw wrenches The wrenches fit all hex-type hollow set screws from No. 8 to % in. diameter all socket head cap screws from No. 6 to 14 in diameter inclusive all steeps. to ½ in. diameter inclusive, all sizes of socket head stripper bolts from % in



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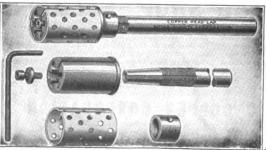


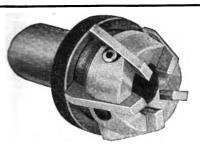


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Place yourself behind this man's desk. You need certain collets and pushers—in a hurry. You place your order with "Modern" and find that within 24 to 48 bours they will be on the

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to 3/4 in. diameter inclusive, and all sizes of hollow pipe plugs from $\frac{1}{8}$ in. to $\frac{1}{2}$ in. diameter inclusive.

The nine wrenches are conveniently fitted into a compact metal box finished in black crackle. The corners of the box are reinforced, providing wear-proof construction.

Federal Model 1 Test Indicator with Universal Bar

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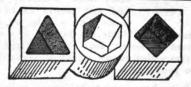
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STURDIMATIC TOOL COMPANY

ucts Corporation, 1144 Eddy St., P. dence, R. I. This indicator is in design to the Model 2, whi announced on page 208 of the J issue of MODERN MACHINE The difference is that whereas the



Federal Model 1 Test Indicator with University

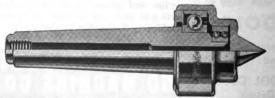
2 is graduated in ten-thousandths. Model 1 is graduated in thousandths The instrument has a n an inch. Th of 0.030 inch.

This same instrument graduated metric scale in 0.005 mm with a range of 0.2 mm, indicated as the M 3, is also available as well as the 1 4, which is graduated by 0.01 mm a total range of 0.8 mm. All instrumhave the same dial and are identicated far as appearance is concerned

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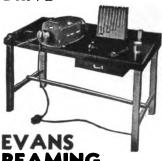


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It can not fall in slots or oil grooves. Extension Pilots for Line-up Work.

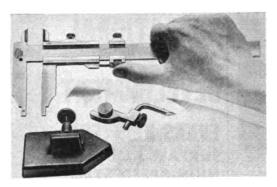
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Mauser Vernier Caliper

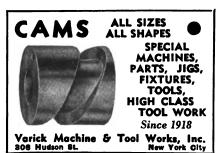
has been augmented by the addition of the Mauser Vernier Caliper shown in the illustration. The caliper is known as the No. 537 and is designed in combination with a height gage. A base is supplied which, when attached by means of a screw and tapered center to the end of one jaw, transforms the caliper immediately into a height gage. The tool is supplied in three sizes with measuring capacities of 7, 9 and 11 in. Graduations are 1/1000 and 1/128 inch. The base is of improved disgn. comparatively large at heavy, so that the height as will rest firmly on the surfip plate without danger of tilts. The vernier caliper has the knife edges which are extremely practical for layout we and also for measuring dances between holes, for measuring root diameters of general soon.

The scribing attachment a separate unit and may firmly attached to the upplay. The scribing attachment has an advantage in that the steel point is adjustable, making it possible to set the height gage at an even figure of the scale when starting to measure.

This feature eliminates a great deal calculation and saves time.

"Unbrako" Self-Locking Hollow Set Screw

The line of "Unbrako" Hollo Set Screws made by the Stands. Pressed Steel Co., Jenkintown, Pa. been augmented by the addition of Unbrako" Self-Locking Hollow



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Screw shown in the illustration. This set screw is so designed that it can be screwed into a hole without difficulty, but locks itself in the hole so that it can only be removed with difficulty and it is practically impossible for it to work loose in service.

To achieve this effect, the two top threads are milled at an angle, the metal being swedged to the upper side so that resistance to insertion is eliminated. As the setscrew is screwed down so that the cup point of the screw is forced into the shaft, the threads of the screw back up against the threads

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of the hole and the prongs of the milest threads dig into the threads in the hole thereby effectually locking the screw in position. It is, of course, necessary that the Unbrako screw, when tightened in position, be flush or slightly below the



"Unbrako" Self-Locking Hollow Set Screen

surface of the work-piece, as otherwisthe knurled threads would not engage the threads in the tapped hole.

The "Unbrako" Self-Locker is said to work equally well in steel cast iron bronze and other metals. The first application is the most difficult, as backing off causes the prongs to wear. It is possible, however, to back the acrew off several times before the locking qualities are lost.

36x42-inch Wheelabrator Tum-Blast

A new model 36x42-In. Wheelabrator Tum-Blast has been announced by Th-American Foundry Equipment Company. 555 S. Byrkit St., Mishawaka, Ind. Many new features have been incorporated in the design of this centrifugal abrasive blast cleaning equipment. Fabricated steel side frames replace cast iron frames formerly used, making the unit much stronger. Welded corner and joint construction assures extra ruggedness and dust-free operation.

Centrifugal force is utilized in whip ping steel abrasive onto metal pieces being cleaned in the 36x42-in. Wheel-abrator Tum-Blast, a gentle tumbling and complete exposure of all parts in the blasting zone being attained through the use of an endless conveyor apron.

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improved suction-type abrasive separator is included at the elevator head as standard equipment on the new This separator effectively keeps the abrasive clean by removing dust and broken down abrasive after burned molding sand, forging scale and other foreign material are extracted by the rotary screen.

The 36x42-In. Wheelabrator Blast, with the standard conveyor, will clean metal parts weighing up to 30 lbs. Pieces weighing as much as 75 lbs. can also be cleaned, when the machine is equipped with a heavy-duty conveyor.



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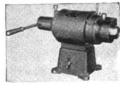
Complete information on this new model and other types of Wheelabrain equipment is contained in Catalog No



36x42-In. Wheelabrator Tum-Blast

211, which can be obtained from the manufacturer.

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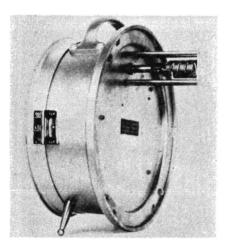
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The hubs of the smaller size wheels are machined from solid stock, and the larger hubs are of cast iron. Either internal or external hubs are available. Steel hubs are locked to the back plates by three embossed keys which, when the back disc and hub are pressed together, fit into recesses in the disc. The end of the hubs which projects through the disc is then spun over to form a smooth joint. Cast iron hubs are fastened to

the back discs by three rivets.

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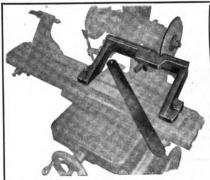
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J. E. MARTIN TOOL & OIE WORKS 518 W. State St. Est. 1912 Springfield, O. by writing the Shakeproof Lock Washer Company. 2501 North Keeler Avenu-Chicago, Illinois.

Spencer "Speedy" Steel Type Holder and Steel Type

The illustration shows a type holds: which has been placed on the marker by S. M. Spencer Mfg. Co., 3 Cornhil. Boston, Mass. As the name implies, the tool is made for the speedy changing of figures or letters used for marking such products as hardware, name plates, machine parts, and so on. The holder itself is of fine tool steel, hardened and tempered. The main body is fitted with a spring clip on one side only, which presses into a groove in each type to hold it in position. The type can instantly be released by pressing a button un the end of the clip. No set screws are required. The type are held in perfect alignment.



Spencer "Speedy Steel Type Holder and Steel Type

The steel type made by this firm are of finest tool steel, with the character finely engraved in the exact center of the type body for perfect alignment. The type are also carefully hardened and tempered. Type are made in a variety of sizes, most of which are carried in stock for immediate shipment. Special sizes can be made

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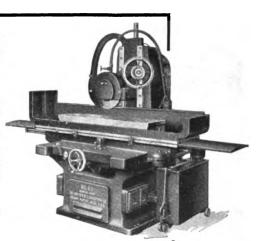
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has been announced by Modine Manufacturing Company, Racine, Wis. Incorporated in this blast heater are several features of design which are said to materially increase structural strength and make for more effective high heat transfer.

According to the manufacturer, one of the outstanding features of this heater is elimination of expansion strain. The expansion bend (patented) allows each tube to expand and contract as its temperature requires without affecting the tube adjacent to it, thus eliminating expansion strain and the possibility of



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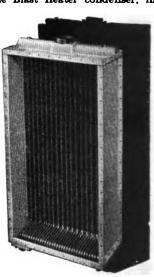
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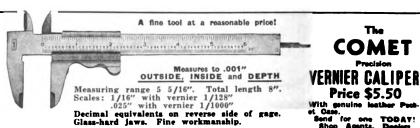
leakage resulting from this strain. Headers and tubes are cylindrical and seamless for greatest possible structura strength. Tubes and headers are brazed into a single rugged unit without the use of gaskets, bolts or screw joints.

All steam-carrying passages of the Modine Blast Heater condenser, includ-



Modine Blast Heater

ing headers, tubes, and inlet and outlet bosses, are of pure copper or copper alloy from the point where the steam enters to where it leaves in the form of condensate. It is claimed that all electrolysis probabilities are thus eliminated. Fins are metallically bonded to tubes to make a permanent junction impervious to years of operation under



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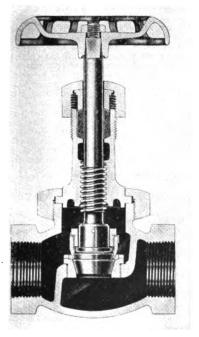
temperatures. Increased aigh ransfer is promoted by scientifically iie-forming fins to give effective turbu-

ence to air.

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Jenkins Plug-Type Valve Seat

Jenkins Bros., 80 White St., New York, N. Y., have announced the Jenkins Fig. 976 Plug-Seat Valve, the feature of



Jenkins Plug-Type Valve Seat

which is that the plug and seat ring are made of a superior stainless steel having a Brinell hardness in excess of 500 known as Jenkins JX500. The valve is especially recommended for severe service such as continuous throttling for pressure reduction or free blow duty such as soot blowers, injectors, heating coils, or any steam line where close regulation is required. It is said that the Jenkins JX500 Plug and Seat practically nullify wear and almost entirely elimi-

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nate danger of wire drawing and cutting.
Inasmuch as boiler scale, pipe chips, welding heads, rust tubercles and iron oxides are generally under 500 Brinell, it is evident that they will not be able to scratch the Jenkins new valve seat.

Stanley Pocket "Flash-Lite" Screw Driver

Stanley Tools, New Britain, Conn., now offers a small size pocket "Flash-Lite" screw driver with clip, designed for use



Stanley Pocket "Flash-Lite" Screw Driver

by householders, car owners, auto mechanics, radio, refrigerator and oil service men who need a handy sized screw driver for working in dark places. The handle, octagon shaped, is made of brass and is finished a crystal black with a contrasting orange stripe. It holds one standard battery and light bulb. The screw cap and clip are nickel plated. The blade, two in. long and ½ in. in diam-

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eter, is made of tempered steel and has an accurate machine cross-ground up Battery and bulb can be replaced easily when worn out.

Taylor Self-Centering Scroll Chud

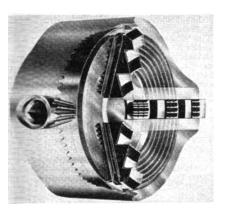
George Scherr Co., Inc., 130 Lafayett St., New York, N. Y., is now marketth the Taylor Self-Centering Scroll Chudshown in the illustration. This chud is designed for the maximum of strength and is especially intended for use with high speed machine tools where tung sten carbide cutting tools are used.

A feature of the chuck is the conshaped design. The chuck jaws grathe work in the same manner as the jaws of any other three-jaw chuck, but instead of having a flat face, the chuck face is cone-shaped, thus providing the maximum of support for the chuck jaw. The ways in which the jaws alide arout into the face in the usual manner. The back retains the internal working parts of the chuck in position and contains the recess for locating the adapter. In all sizes above 8½ in, the centra portion of the body passes through the back of the chuck, giving the maximum of strength with the minimum of depth.

The spiral is of steel, hardened and







Taylor Self-Centering Scroll Chuck

ground perfectly true. Teeth are cut into the back of the spiral and the spiral is revolved by means of any one of the three pinions. Upon the cone-shaped front face is cut a spiral V-thread which engages with the teeth cut in the back of the jaws, thus advancing or withdrawing the jaws simultaneously

and gripping the work true without setting. The unusual rigidity and strength of this chuck is due to the fact that the jaws are supported immediately behind and at right angles to the line of pressure applied when the work is gripped. This construction enables the important working parts to be hardened, and it is said to be impossible to strip or bend the teeth at the back of the jaws or to tear out the body ways in the chuck body.

The regular jaws are made of special steel and are hardened all over, after which they are ground perfectly true on the parts which slide in the chuck body and, in position, on the parts which grip the work. Soft jaw blanks can be provided, especially adapted for holding odd shapes of work. The front part of these jaws is left soft so that they can be machined as required to hold the work, but the teeth at the back are hardened and the parts which slide in the chuck body are hardened and ground. The bevel pinions for revolving the spiral are of chrome nickel steel, electrically heat treated and ground and tested before assembling.

The chuck is made in sizes of $4\frac{1}{2}$, $5\frac{1}{2}$, $6\frac{1}{2}$, $8\frac{1}{2}$, $10\frac{1}{4}$, $12\frac{1}{4}$, $16\frac{1}{4}$ and 20 in., weighing from $8\frac{3}{4}$ to 246 pounds.

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New Literature

Outdoor Lacquer No. 4917, a brass and silver lacquer for outdoor exposure, is described in a produc summa y issued by Roxalin Flexible Lacquer Co., Inc., Elizabeth, N. J. Unusual adhesion and high resistance to "spotting out" are advantages claimed for this clear, cellu-lose type, air-drying flexible lacquer. Copy free upon request.

Chicago Pneumatic Bulletin 762. The Diesel engine-driven compressors of the Class WO-2 Portable Type and the Class W-CO stationary Type products of Chicago Pneumatic Tool Company, 6 East 44th St., New York, N. Y., are described and illustrated in an eight-page folder now being issued by this firm. Also included is information on CP Aftercoolers for the removal of oil and moisture from compressed air. Copy free upon request.

Rex-Weld and Rex-Tube Flexible Metal Hose Catalog. In this catalog, the Chicago Metal Hose Corporation, Maywood, Ill., presents detailed information on their line of Rex-Weld and Rex-Tube

Flexible Metal Hose for use with allrated steam, superheated steam, fuids chemicals, and for certain special uss. The construction of the tubing is described with the aid of cross-section drawings. Numerous industrial andications of the tubing are cited, and the characteristics and advantages of the type of connection are discussed. Instructions for ordering are included Copy free upon request.

Wales Dies. The Strippit Corporation 1559 Niagara St., Buffalo, N. Y., has published an attractive eight-page bul letin covering the Wales Individual Self-Contained Sub-Press Type Notching Dies, Punching Dies and Stripping Units made by this firm. These dies may be set up in any number of patterns to punch holes and cut notches in fat sheets and parts. Wales dies may be set up in many ways, the three principal ones being (1) on templates, (2) or T-slotted plates and (3) in press brakes The advantages and applications of these dies are described and illustrated with photographs and drawings. One page is devoted to a discussion of the use of Strippits in connection with stripper



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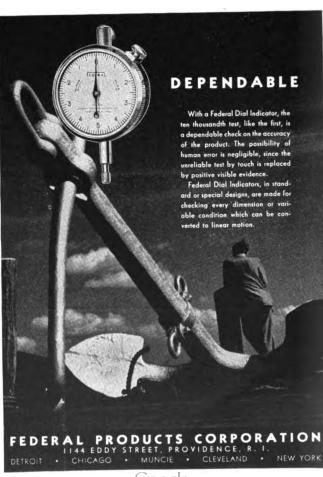
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LVC., Milwaukee, Wisconsin.

No. 35 Cross Gear Tooth Rounder Buletim, issued by Cross Gear and Machine Company, 3250 Bellevue Ave., Detroit, Mich., is devoted to the presentation of the No. 35 Cross Gear Tooth Rounder. This machine can be used not only as a single purpose tool, maintaining high efficiency in mass production, but also as a tool that is universal in its

universal in its application to many different pieces and operations. A number of views of the machine are shown and a list of specifications is included. Copy free upon request.

Cross Milling. Gear Pointing and Chamfering Machines. Two new models, designated as the Nos. 40 and 41, have been added to the line of milling, gear pointing and chamfering machines manufactured by the Cross Gear and Machine Co., 3250 Bellevue Ave., Detroit, Mich. The machines. which are automatic, are built with an integral indexing mechanism and complete control, electric and may be tooled up for internal and external gear tooth chamfering operations on either spur or helical gears. Illustrations of the Nos. 40 and 41 are included, together with views of the various parts of the machines. The folder contains complete descriptions and specifications. Copy free upon request.

discussion of the features and advantages of the Carbonol Process for carburizing steels in the Hevi Duty Carburizer is presented in Bulletin HD 937, published by the Hevi Duty Electric Company, Milwaukee. Wis. The bookle is well illustrated with photographs and drawings, and includes specifications covering the five types of Hevi Duty Carburizers. Copy free upon request.



Catalog E of Hotspot Electric Soldering Irons. This four-page bulletin illustrates and describes the line of electric soldering irons made by the Vasco Electrical Manufacturing Co., 4116 Avalon Bivd., Los Angeles, Cal. Specifications and prices are included. Copy free upon request.

Handy Flux Bulletin No. 9. A low temperature flux for brazing steel, stainless steel, monel metal, nickel, copper, beryllium-copper, brass, bronze, aluminum bronze and various other ferrous and non-ferrous metals and alloys, to be known as Handy Flux and marketed by Handy & Harman, 82 Fulton St., New York, N. Y., is described in a four-page folder now being issued by this firm. Outstanding features of Handy Flux and directions for its use are also included. Copy free upon request.

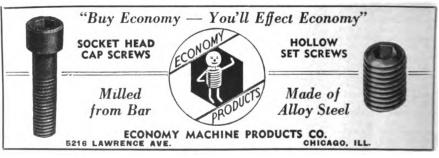
Star Hack Saw Blade Catalog No. 51. This attractive 24-page catalog issued by Clemson Bros., Inc., Middletown, N. Y., opens with a section devoted to the history of Clemson Bros. and the development of Star Hack Saw Blades. Another section gives suggestions for the proper use of hack saw blades. De-

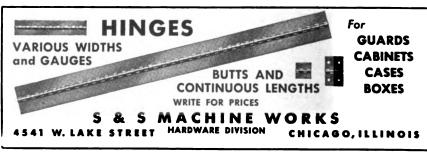
scriptions, illustrations and specifications covering the complete line of Star Hack Saw Blades are presented. A feature of the booklet is the explanation of the five points of the Clemson Star—Clemson Experience, Clemson Steel, Clemson Teeth, Clemson Set, and Clemson Heat Treatment.

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New Profits in Arc Welding with the New Simplified 40 Voit Hobert Arc Welder. This booklet, a publication of Hobert Brothers Co., Troy, Ohio, includes chapters on the following subjects: Types of Job Welding Shops, Types of Welding Equipment, Where an Arc Welding Job Shop Will Pay, Special Training for General Job Welding, Essential Equipment for the Job Shop Other Desirable Equipment, Why Arc Welding is Most Important, Extra Profits from Portable Equipment, Customers of the Job Welding Shop, How to Build a Job Welding Business, How to Build a Job Welding Business, How to Set Prices on Job Welding, Choosing the Right Size Welding Machine, and What to Look for in a Welding Machine.

The booklet is well illustrated with installation photographs showing Hobert Arc Welders in use on a variety of jobs. Copy of the booklet free upon request.







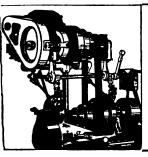
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Lubrite Bushings. What Lubrite Oilless Bushings are and how they work is discussed in a folder published by Merriman Bros., Inc., 185 Armory St., Jamaica Plain, Boston, Mass. The bushings are suggested by the manufacturer for use without oil, for heat applications, for cleanliness and inaccessibility, for heavy and shock loads, and for water, dust and dirt. Copy free upon request.

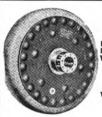
Laminated Brass Shim Stock Specifications File. Of especial interest to chief designing engineers and their staffs is a convenient new specifications file folder issued by the Laminated Shim Company, Long Island City, N. Y. The file presents detailed specifications of Laminated Brass Shim Stock, known as Laminum, in such handy form that essential information on the materials, their composition and degree of lamination, stock size, and so on, is available at a glance.

Copy free by addressing Laminated

Shim Company.

Gisholt Heavy Duty Turret Lathes. Gisholt Machine Company, 1217 E. Washington Ave., Madison, Wis., announces the publication of a new catalog which covers the complete line of Gisholt Improved 3AL, 4L and 5L Heavy Duty Turet Lathes and optional special attachments, mechanical and hydraulic churand standard tool sets. The optional equipment is said to readily adapt the machines to individual requirement. The catalog describes the many improve features of the lathes that make is maximum production, greater accurate and low maintenance cost. Copy in upon request.

Hunt Air and Hydraulic Valve Catalo 1 M. This catalog, issued by C. B. Ht and Son's Company, Salem, Ohio, cludes not only revisions and addition to the Hunt air control line, but also new section devoted to this compa new line of hydraulic valves for 1000 a 2000 lbs. working pressure and for 3 and 5000 lbs. working pressure. plete physical data and engineering da are given for the benefit of the user. unique feature of the hydraulic section is the inclusion of integrated tables piston displacements, rate of piston d placement, and velocities through valv and piping. The catalog, which is stan ard 8½x11-in. size, has an attractive cellophane cover. Copy free upon R quest.



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Baldwin-Duckworth C. P. S. Bulletin No. 61. The features and advantages of Baldwin-Duckworth Continuous Plane surface Conveyor Chain are outlined in folder issued by Baldwin-Duckworth Chain Corporation, Springfield, Mass. Specifications covering dimensions, list prices, material description, and sprocket liameters are given. Copy free upon request.

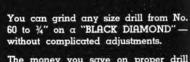
Fostoria Handbook of Localized Lighting, now being distributed by The Fostoria Pressed Steel Corporation, Fostoria, Ohio, presents information on the following subjects: Good Lighting Practice, Selection of Supplementary Lighting Units, Standard Fostoria Reflector Assemblies, Efficiency Comparison Charts for Fostoria Reflector Assemblies, Efficiency Comparison Charts for Fostoria Base Attachments, Fostoria Complete Lighting Units, and Fostoria Localite Accessories and Parts. The booklet contains illustrations of the various types of Fostoria Lighting Units for use in industry, and lists specifications for these units. Copy free upon request.

Firthite Standard Tools, Bits and Tips. This 16-page folder, comprising specifications and price lists for Firthite Standard Tools, Bits and Tips, contains views of many different Standard Firthite Tip designs and Standard Firthite Tools. It also shows a number of interesting Non-Standard Firthite Tools and Tips. The folder is profusely illustrated by engineering drawings and includes such information as the recommended symbols used in specifying rakes, angles, clearances, radii, right and left hand single pointed tools, and so on The folder should be useful to all users of Sintered Carbide Tools. Copy free upon request to Firth-Sterling Steel Company, McKeesport, Pennsylvania.



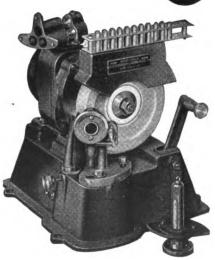
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How To Make Your Own Carboloy Tools. Carboloy Company, Inc., manufacturers of Carboloy cemented carbide tools, dies and wheel dressers, has recently issued an illustrated booklet, designated as T-37, describing in detail a process by which Carboloy users can make Carboloy-tipped tools in their own plants. This booklet includes the following information: Selection and preparation of shanks; selection of proper tip and braze media; preparation, cleaning and assembling of tip; torch and furnace-

brazing procedures including suggestions and furnace specifications; illustrations of typical Carboloy tools now being made in the plants of users by this method, and other suggested tool designs. An insert showing the 152 Carboloy standard blanks and prices is included.

Users and prospective users of Carboloy cemented carbides will find this booklet an excellent guide in making their own tools. Copies free upon request to Carboloy Company, Inc., 2975 East Jefferson Avenue, Detroit, Michigan

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ton Multipurpose Grinding Ma-Versatility, simple set-ups and nient controls, which are the outng features of the Norton Multise, are presented through the use scriptions and installation photoin a four-page folder issued by orton Company, Worcester, Mass, of construction and operation of iversal headstock, universal grindieel head, and quick-acting, levered footstock are also included. ree upon request.

-Belt Book No. 1532. A 16-page ted list-price catalog on friction is, known as the No. 1532, has ompleted by Link-Belt Company, Michigan Ave., Chicago, Ill., and available for distribution. Besides sizes, dimensions, weigths, horse-ratings, and other pertinent tabita on both Meeseco and Twynpes of clutches, the book devotes ges on the subject of how to sed order the right clutch for the To obtain a copy, address the lit Company, as above, or the Link-Belt office, asking for Book 2.

ney Roller Chain Catalog V-125.

Approximately 100 pages of descriptions, illustrations and specifications covering the line of roller chains and sprockets made by The Whitney Chain & Mfg. Co., Hartford, Conn., are included in this catalog. A chain and driving sprocket selection table, roller chain length table, and other information of value in the selection of this type of equipment are also given, although the book is intended primarily as a price list and reference book on Whitney stock and made-to-order sprockets.

Copy free upon request.

Horizontal Napler Band Saw Machines for Modern Metal Cutting are featured in a folder which has been issued by Metal Saw & Machine Co., Inc., 40 Napler St., Springfield, Mass. According to the manufacturer, these band saw machines will cut everything from white metal to high speed steel, and from ½-in. tubing to a 10x10-in. I-beam. The Model "B" and Model "L" machines are illustrated by means of labeled photographs which indicate the various parts of the units. Specifications and descriptions are given.

The folder also includes illustrations and specifications for band saws for metal cutting cut to length and elec-

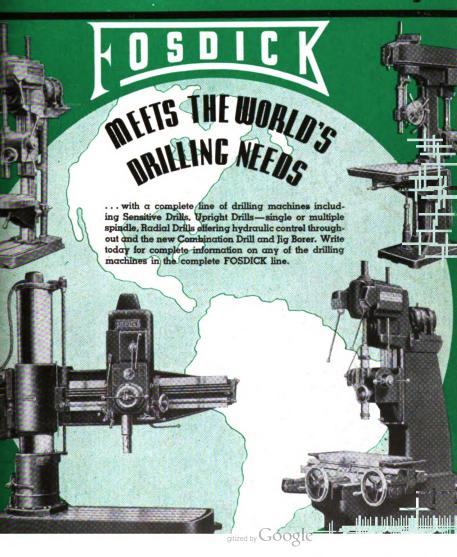
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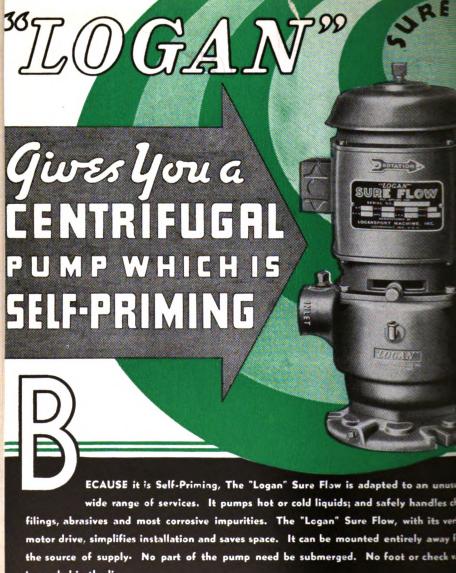


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HOWARD CAMPBELL, Editor		
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CINCINNATI, OHIO

ECEMBER, 1937

Vol. 10, No. 7

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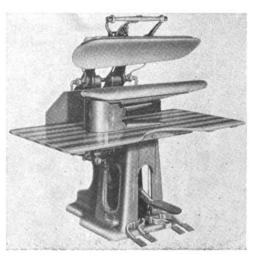
BY HOWARD CAMPBELL

TO MOST of the readers of this page, the name "United States ioffman Corporation" will instantly bring to mind the steam pressing ma-

chine which is to be found in practically every tailorshop or pressing establishment throughout the country. However, this is only one of hundreds of different types of machines made by this firm, the line of products also including machines for clothing manufacturers, equipment for dry cleaning establishments, laundries, and so on.

Considering the wide variety of the line and the range of types and sizes, the manufacturing end of the business might be compared to operating a huge jobbing shop on a production scale. Parts are processed in lots of a few dozen or a few hundred at a time, necessitating tooling which must be efficient and at the same

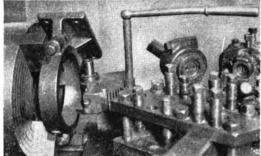
time within definite limitations as to cost, the amount allowed being based, of course, upon the number of parts required for a year's production of



U. S. Hoffman Pressing Machine



be used.



the machines upon which they are to

Self-aligning bearings are used to a large extent in the construction of laundry and dry cleaning machines, necessitating radial bearing and corresponding radii in the hous-The illustration Fig. 1 shows the tool used to bore a 3%-in. radius in a holder for a trunnion bearing housing. The work is being done in a Jones & Lamson turret lathe, and the radius boring operation is performed with a tool which is attached to the turret. As can be seen by reference to the illustration, the tool

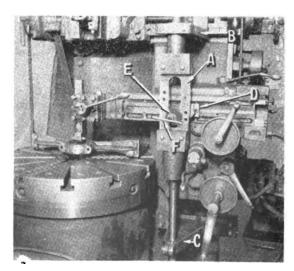


Fig 1-Boring a 3%-in. re trunnion bearing he

bit is locked in position in a tool holder which is practical ly a section of a segment upon the radius of which gear teeth have been cu-The segment is held by a pivot at the apex, the dr mension from the center of the pivot to the end of the

tool bit being the dimension of the

required radius.

Meshing with the gear teeth on the segment is a pinion so pinned that it may be revolved by means of a vertical shaft and the horizontal handle which can be seen at the top of the shaft. The housing, which is 1% in thick and 7% in. diameter inside, s first bored and then the turret is advanced to bring the segment pivot exactly at the center-line of the ra-The pinion has previously beer revolved to rotate the segment and bring the tool bit around to a point where it will be clear of the work-

> With the turre: piece. properly located, the pinion is revolved so as to feed the tool bit into the work, thus boring the required radius. This too is as efficient as it is simple.

A similar radius is bored into the workpiece shown clamped at the table of the boring mil illustrated in Fig. 2. The radius in this piece header clamp for a self-

in a header clamp for a aligning bearing. too long to swing in a lathe

amele. The machine is a by turret lathe with a special chament to provide automatic while feeding at an angle.

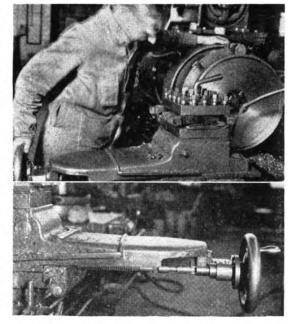
4—This view shows the cket and universal joint chament it possible for the special chament chamber it possible for the special chamber it possible for the special control of the special chamber it possible for the special control of the special chamber it possible for the special control of the special chamber it possible for the special control of the special chamber it possible for the special chamber it possible for

gning bearing—is only 2-in. diameter, but the ece is too large to swing a lathe and therefore e boring mill is used. he radius boring attachent in this case is somethat more complicated.

The attachment consists rincipally of the guide A hich is held in position y shafts on the ends exending upward through the bracket B and down-

rard through the bracket C. The rackets are bolted solidly to the manine, and after being adjusted, the

hafts at the ends of the uide are also locked in nosition. To the ways of he side head is clamped block D to the face of which an arm, in the chape of another block, is pivoted so that it can using and through which a hole has been bored upon the desired radius. The cam E, which is a sliding fat in the slot in the guide, has a hole which corresponds with that in the



block previously referred to and after the workpiece has been bored to the required diameter, a pin to which the

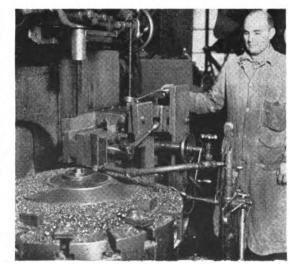


Fig. 5—Machining an 8 deg. 3 min. taper on the bottom of an extractor basket for a laundry machine.

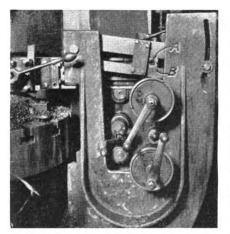


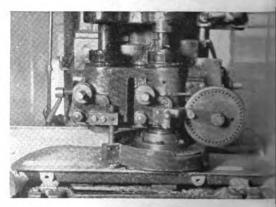
Fig. 6—Taper attachment used on a Bullard vertical boring mill to machine tapers on extractor baskets.

handle F is attached is inserted through the cam and into the block, pinning these two parts together. The cross feed screw of the side head having previously been removed, there is nothing to prevent the horizontal movement of the side head except the fact that it is controlled by the cam E. Consequently, as the vertical feed is applied, the head must necessarily move horizontally upon the radius provided by the dimension between the two pivots.

There are two holes in the block, one positioned for the rough feed and the other 7/16 in. closer to the vertical center-line of the machine table, for the finishing cut. The tool machines a 2%-in. radius in the housing, boring the diameter to 4.749—4.751 inches.

Fig. 7-Milling a radial surface on a head for a Hoffman pressing machine. In Fig. 3 the operation of facing the bottom of an extractor basket is shown. The workpiece is of cast steamed the machine is a Libby turnelathe. The interesting feature of the operation is the fact that the bottom face must be faced at a 514-det angle.

In order to provide for automatic feed while feeding the tool at a 54 deg. angle, a special attachment had to be made up for the cross slide The original cross slide gib was replaced with a tapered gib so that the slide rest could be fed at the desired angle providing means could be devised for feeding it. Inasmuch as the cross feed screw is set into the carriage in such manner that it must necessarily feed straight across, or a 90 deg. to the bed ways of the machine, the feed could not be used originally constructed. Accordingly the feed was disconnected from the slide and a special bracket, indicate by the arrow, was designed. A hole provided through which the bracket could be bolted securely to the end of the cross slide, and another hole was provided to support the hand wheel spindle. Between the spindle and the end of the cross feed screw however, a universal joint was inserted which made it possible to feel



d special milling ure for machining of rames for a Hoffing of the cutter spindles feed are rides a pair of rails lood on rais in odd on rais in one being carried on eals operating in a ck so that the mane can be moved the and forth from to another.

e cross feed rew either by e handle or aumatically rematically rengle of the cross ide as long as it

d not exceed the 5½-deg. angle. he universal joint can be seen in Fig.

As a matter of fact, in taking the implete cut across the bottom face? the workpiece, the end of the feed frew may be out of line with the and wheel spindle as much as 3/16. This device works very satisfacrily.

The outer face of the bottom of the stractor basket must be machined an angle also, which operation is

performed on a Bullard vertical boring mill as shown in Fig. 5. The basket is 19-15/16-in. diameter and the taper required across the bottom is 8 deg. and 3 min., which makes a difference in height of 1-15/16 in. between the rim and the center.

In order to hold the basket for this operation, the inside is machined to close limits for a drive fit on the plate which serves as the locating plug and fixture. To further aid in holding the

workpiece, it is clamped through the center hole as shown. Thus held, the periphery of the piece is turned, then the chuck jaws are tightened against it and the clamp is removed from

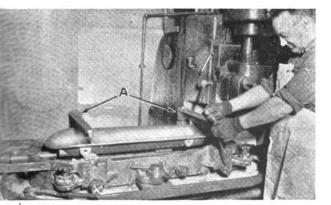


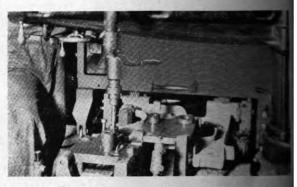
Fig. 8—Locating and clamping the pressing machine head for milling as shown in Fig. 7.

Fig. 11—Milling and drilling second side frame for Hoffman presser.

the center.

A Carboloy tool is used, taking a 0.018-in. feed with a ½-in. cut while the work is revolving at 23 r.p.m. In order to obtain the necessary taper while the cut is being made, the attachment shown in Fig. 6 is used.

The cross head in which the tool is held is fed by the usual side head screw, but the vertical feed screw is disconnected so that the side head can be moved vertically independent of the screw. To the side arm is attached a block which is threaded for the pivot pin A, located in the sliding block B. It is obvious that, as the tool feeds horizontally, the entire side arm must move up and down according to the angle of the slot in which the block B slides. This taper attachment and the support upon which it is held are anchored firmly in position, as shown.



The surface of the head for pressing machine, which is of aluminum, must be machined on a radiu and after many trials with variou kinds of fixtures and attachments, it was found that the best way to perform this operation is with a 14-in cutter ground to provide the desire radius. The operation is performe in an Ingersoll mill, shown in Fig. 7 A large part of the success of the operation can, however, be credite to the fixture used, shown in Fig. 8

The two arms A carry locater made from sheet metal machined to exactly the correct radius. Upon placing the work-piece in the fixture

these locaters are swung around into position and inasmuch as they synchronize, the work piece is easily located for height and alignment with the center of the cutter spindle. When properly located, the piece is

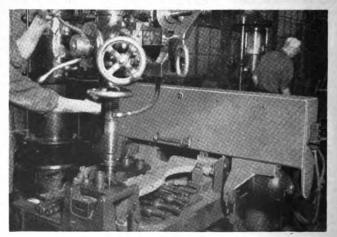
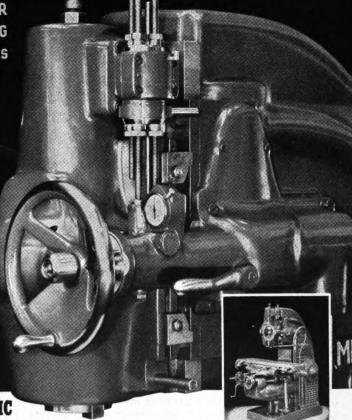


Fig. 10—Drilling and end of a side fram while pads at the other end of the fram are being milled.

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clamped by jaws which grip it from both sides, each pair of jaws being governed by a square threaded screw so that the jaws can be tightened by revolving as shown in the illustration. From 1/16 to 1/2-in. cut is taken, with the cutter operating at a speed of 1054 ft. per minute. The cutter has 12 blades, two of which overlap at the center, and from 100 to 150 workpieces are machined between grinds.

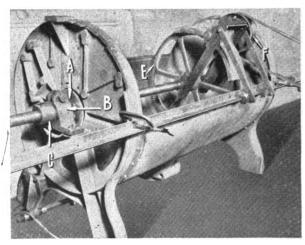


Fig. 12—Equipment set up for machining face of counterbore for packing gland on a Hoffman 36-in. Vortex Washing Machine.

The side frames for a pressing machine are constructed in pairs—one right and one left-and the machining operations are practically identical except that a different jig must be used, of course, for each side. However, the same milling equipment can be used to mill two pads in both The work of milling and drilling these side frames is expedited by setting two radial drills closely enough together so that a special milling tool can be used, between the machines, to machine the pads on both The two drilling machines and milling fixture are shown in operation in Fig. 9.

The milling fixture not only rides

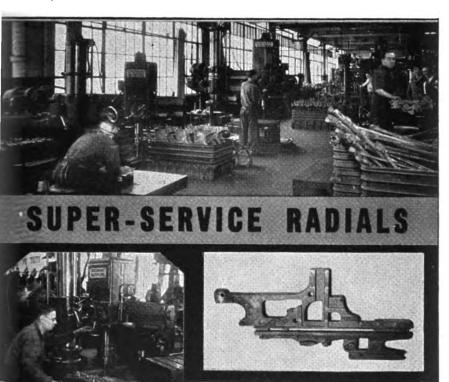
on an individual track by which is lifted up out of the way when in use and lowered onto the when necessary, but the entire anism rides on a track in the by which it can be moved backforth from one machine to the The drilling machine operator those holes in the end of the in which the pads are located then uses the special fixture

the pads while and drilling the hold the opposite end the frame. In Fig. 10 operator is shown ing the holes in the end of the frame as to the milling fixture.

When ready **to** the milling fixture jig leaf on that the frame is the back out of the the fixture is over until the c are properly locate milling the pads. the milling mech is operated and the ters are dropped to the required he to machine the pads properly. When thus

lowered, the feeding mechanism is brought into play and the milling operation proceeds. The milling cutter spindles are held in housings through which a lead screw runs having left and right hand threads so that the cutters can be fed outward from the center. The time required for a milling cutter to travel the required distance is practically the same as that required to drill the holes in the opposite end of the frame.

When the milling and drilling operations are completed, the cutters are automatically raised and the milling equipment is pushed back into the open space between the two radial drills. By this time the operator on



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the other drill has drilled the holes in the end of the frame nearest to the fixture and is ready to use the fixture. He removes the jig plate from that end of the jig, pulls the milling fixture over into position and proceeds to duplicate the operation described above. The method described here is not only economical and efficient, but

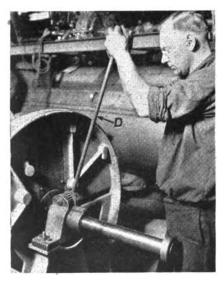


Fig. 13—The rack and pinion provide means for feeding the cutter against the surface to be machined.

it insures an even production of right and left frames.

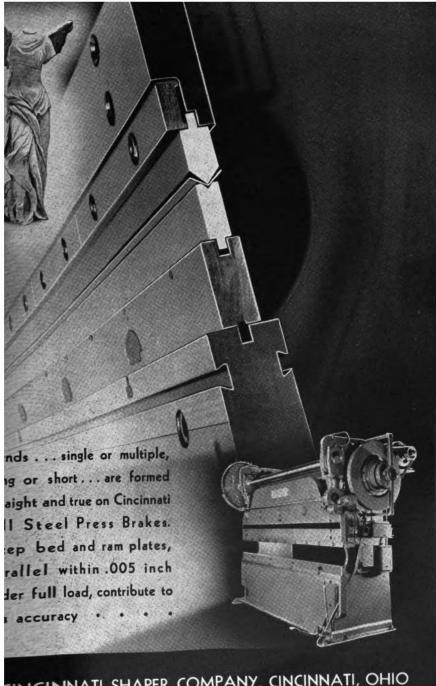
The drilling and milling operations on the second side frame are shown in operation in Fig. 11.

The equipment for facing the packing glands on a 36-in. Vortex washing machine is shown set up in Fig. 12. The alignment of the shaft of this machine in its bearings must be practically perfect, so as to make it impossible for water to leak out of the machine through the bearings, consequently these packing glands are faced with a shaft of the specified size in the machine.

In order to apply this equipment, the shaft is first inserted through the bearing holes. Then a cutter head A is slipped over each end of the shaft. followed by a bracket such as shown at B. The cutter head is 9 in. in di ameter and the face of the cutter holds six high speed steel blades. The bracket B is anchored in position by bolting to the lower half of the bear ing, using the bearing cap holes. To each cutter is attached a sleeve! in the top of which is inserted, los tudinally, a rack that meshes with pinion. This arrangement can be both in Figs. 12 and 13. The pinis shaft carries a hub at one end i which a hole is drilled to receive the rod D, Fig. 13. By swinging this red in a vertical plane, the shaft, carrying the cutter head, can be fed horizontally and pressure applied to force the cutter blades against the surface of the packing gland.

In order to obtain power to revolve the cutter heads, the shaft also carries a large gear E, Fig. 12, which meshes with the pinion located on the same shaft which carries the pulley To hold the pulley in position and maintain the proper center distance between the gear and the pinion, the pulley shaft is carried in a frame which is held at one side by the shaft and at the other side by clamping to a length of angle steel which, in turn. is clamped to the washing machine frame. Power is transmitted by belts to the pulley from an electric motor on a separate stand. With the motor running on the shaft and the cutter heads revolving, the cutter is fed against the surface of the packing gland as shown in Fig. 13 until the gland is properly machined.

The drilling and tapping fixture shown in Fig. 14 comprises a perfect example of an efficient tool which can be easily adapted for a wide variety of work sizes. This gib, which is simply an angle plate with locating pins for the work and interchangeable.



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SHAPERS

bushings for the drill, is used to drill and tap steel collars. A two-spindle drill is used, the tap being driven by an Ettco tapping attachment. After one collar has been drilled, another one is slipped into position under the drilling spindle, the drilling feed is applied and the operator proceeds to tap the hole by hand with the other spindle. Thus one piece is in process

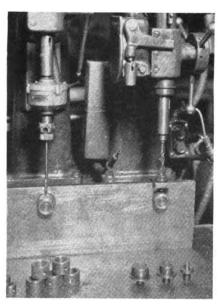


Fig. 14—A simple but efficient drilling and tapping fixture.

of being tapped while the other is being drilled.

The pins onto which the collars are slipped are of varying sizes according to the different sizes of the collars, but that part of the pin which is inserted through the hole in the angle plate is the same in all cases so that all pins fit the angle plate. A wide variety of drill bushings can also be used in accordance with the varying sizes of the holes in the collars.

Metalspray Bulletin 800. This bulletin, now being distributed by Metal spray Company, Inc., 115 Llewellyn St Los Angeles, Calif., presents a variety of tasks which are accomplished by the us of the Metalspray to spray hot meta. The Metalspray is a spray gun throug which brass, copper, lead or other metal are fed, atomized by a flame of interesheat, and sprayed by means of an at blast at the same time, thus making it possible to coat a surface with a thilayer of metal in much the same man ner as lacquer or paint is sprayed with an air-operated spray gun.

Bulletin 800 describes and illustrate a variety of jobs in which the work pieces have been reclaimed by buildin up worn spots or sprayed with meta for protection against corrosion, we and so on. The illustrations show a 5-ft seal ring for a 25,000 h.p. water turbin which has been reclaimed by buildin up the worn parts with sprayed bras pumps rods which have been reclaimed by spraying the worn areas with stee cast iron Diesel engine pistons which have been reclaimed by building up with both low carbon steel and high carbon steel, a motor housing which is sprayed with aluminum to protect it against corrosive fumes, switch boxes which see spraying with high carbon steel, and so on. Copy of the bulletin free upon sequest.

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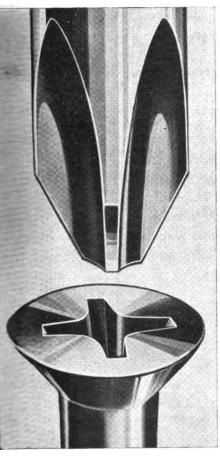
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Securing Employee Cooperation in the Railway Industry

BY ERNEST W. FAIR

CVERY machine shop executive well knows that if the employees in the plant could be persuaded to give thought to ways and means for improving the production tools and methods, the efficiency of the plant could be increased immeasurahly. The difficulty lies in the inregarding

these matters, so far as the employees are concerned, due both to modesty in the matter of making suggestions that have not been requested, and to lack in incentive. The average workman will work satisfactorily with the tools that are given to him, but will be apathetic about making suggestions for improvements unless he sees some chance to benefit by the improved performance.

Many plans for inducing the mechanics on the job to think about their work and make suggestions that would help to increase either the quantity or the quality have been tried, but practically all have been discarded. This statement applies to the railways as well as to other industries. However, some of the ideas that have been worked out in the railway shops have been retained and are classed as among the most effective of those now in use.

Apathy can be transformed into action and inertia into energetic thinking on the part of the employees. This article tells how the "suggestion" method is working out in several large railroad shops.

The Baltimer and Ohio Railros has a cooperativ plan that has been in effect for near 15 years, and be proved very see cessful in stimulation ing the initiative the workmen in th The Pess Railro operates a Bures of New Ideas the has brought i more than 14.00

suggestions in fifteen years, of whin 30.1 per cent were adopted in 1933 30 per cent in 1935, 32.9 per cent in 1934, and so on.

The Great Northern Railway Com pany uses meetings with the en ployees and supervisors in the shop to get results. The Union Pacifi Railroad uses a system of direct sur gestion from the mechanics to super intendents which has been effective in increasing the shop efficiency. The Boston and Maine Railroad offers cash prizes for suggestions or activities beyond the regular duties of employees that result in net money to the railroad, either through savings en by averting accidents that might cost the railroad money. Personal contact of employees by supervisors has been found best in Missouri Pacific shops.

All these and many more similar methods are bringing results in shee dollar savings and accident reduction, in addition to the discovery of more

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Receipt of every suggestion will be acknowledged immediately. Later, the employe will be advised of the result of the study made of the suggestion, and, if R is not adopted, the reasons why.

Communications will be treated by the Bureau as confidential; the employe's name will not be disclosed without securing his consent.

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Providence

January 25, 1937

efficient ways of doing the job. Our space does not permit us to completely present the systems used by every railroad, but rather than only briefly offer the plans of all roads we will devote considerable space to representative plans and suggestions of each group of ideas.

"The method of personal contact of employes by supervisors has been of more benefit in trying to develop improvements than leaving it to the men to offer suggestions themselves," explains O. A. Garber, Chief Mechanical officer for the Missouri Pacific Lines. "The attitude assumed by supervisors in handling their men has a great influence toward inducing men to improve the manner of doing their work, both in the quantity and quality of work turned out. The methods of approach taken by the supervisors in getting next to their men must of necessity be varied according to the different types of men on the jobs. They must always be given credit for whatever they may have to offer.

"If a suggestion is thought to have merit it is tried out and if practical full credit is given to the man offering it. If it is not practical we explain to the man why it cannot be used. This method of handling suggestions is believed to promote a certain amount of job pride and cooperation."

In each of the Missouri Pacific shops there is a production foreman. A part of his duties consists in handling the routine of work in the shop and checking the speeds and feeds of various machines. He comes in close personal contact with most of the men every day and thus has an opportunity to learn, verbally, short cuts from the employees.

The form used by The Missouri Pacific to check the operation of machines which is shown herewith. The machine foreman makes this check with the machine operator, who makes it possible to develop the maximum

efficiency of the machine. At the bottom, space is provided for remarkand suggestions to be made by the man operating the machine or by the superintendent for the purpose of increasing the output of the particular unit of work being checked. After the capacity of the machine has been determined, the operation of the machine is checked from time to time to see that it is producing the result expected.

It may be noted that the name of the machine operator is purposely omitted from this form in order to convey to the man the idea that it is only the machine that is being checked, and any suggestions the operator can offer for improved operations will be welcomed.

In the Union Pacific Railroad shops suggestions regarding methods for developing short cuts and for improving work are made by the mechanic assigned to the job, generally to his supervisor, and if the suggestion has merit, permission is readily obtained for putting the suggestion into effect and for making the required tools or devices.

It has been found that mechanics in the U. P. shops prefer to present their suggestions verbally and for discussion on the job rather than in written reports. Suggestions of a minor nature are handled by the supervisors, but suggestions involving expensive devices or complete changes in methods are necessarily presented to higher officials for decision.

Devices for lifting equipment or material, or where safety is involved are checked by the engineering department. Drawings and instructions are prepared for suggestions which may be used to advantage at other points.

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materials, devices for lifting and placing air reservoirs and springs in place on the locomotive, tools for machining ports in cylinder bushings, and tools for finishing the square ports in valve

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bushings, and for blocking exhaust nozzles when testing superheater units, gages for machining piston heads and cylinder heads, special reamers for crossheads and rods, and devices used in machining various locomotive parts.

"It is the practice at all of our shops", explains Henry Yoerg, General Superintendent of Motive Power for the Great Northern Railway Company, "to have meetings with the employees and supervisors in the shop and go over conditions as to manner and methods of performing work. In this way many practices are brought to the attention of the committee as to savings that would be secured by different methods of performing work. These methods are tried out, and if they are successful, they are introduced in other shops.

"We recently improved our methods of tempering and reconditioning the coil springs which are used on freight and passenger cars, which work is all done automatically with the use of pyrometers and time element machines to produce the proper heat and tempering of the springs. This improvement has netted the Great Northern close to \$2400 per year in savings."

The Louisville and Nashville Railroad Company has a suggestion system which appeals to the employees' personal interest in the road. Each shop employee receives a copy of a little green book explaining the full system and is urged to use it. A Suggestion Board has general charge of the system with committees set up in each major department, composed of officials and employes familiar with the work in that department, which cooperates with the board and the official head of that department in handling all suggestions.

While printed forms are provided their use is not compulsory in making suggestions. Each suggestion should be signed with the name of the employee and mailed to the board at the road's general offices.

Upon receipt of the suggestion it is numbered, acknowledged, recorded and considered. If deemed desirable, it is copied (but without the name of the suggestor) and referred to a selected committee of the department affected, for study. Upon completing its study, the committee makes its recommendation to the head of the department who considers it and forwards it with his recommendation to the board for disposition.

Cash awards are made for suggestions adopted that result in tangible savings to the company. The awards are never less than five nor more than twenty-five dollars. In the event suggestion is found to be impracticable, the board advises the suggestor why it was not adopted.

Two examples of suggestions received from shopmen are given herewith as examples of the alertness which can be developed in shop men by such a plan.

First; "At Corbin Shops, material that is discarded is loaded into a car and placed near the back shop and roundhouse. This material is handled by laborers who do not know what material is usable. Also there is no place provided for storage of material that might be used again. Listed below are a few items of material that have been seen in the scrap car: (a) Bar iron of different dimensions in various lengths up to ten feet, (b) new bolts of different sizes, (c) practically new brake shoes, and other items too numerous to mention. recommend that this scrap be sorted by competent persons and a place provided for storage of usable scrap and a method devised that it may be used and credit given where due."

Second; "Put small ventilators in sides of cushions on engineers seat box like the ones used on all good inner spring mattresses to let air out of seat cushions when anyone sits on

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them, to keep this air pressure from forcing its way out through seams and tearing the stitches out of corners of cushions."

The Boston and Maine Railroad operates a suggestion contest on much the same lines as this L & N plan from time to time. Prizes of from \$5 to \$25 are offered. Every suggestion offered is acknowledged and the writer is advised as to the final disposition of the matter.

Space prevents our presenting more than two more plans at any length, so we will discuss two of the most interesting of all, that used by the Pennsylvania Railroad, and the very efficient and result-getting plan sponsored by the Baltimore and Ohio Railroad.

The Pennsylvania has for more than ten years been operating a "Bureau of New Ideas" for the purpose of encouraging employees to submit original thoughts for improvement and protection. Employees are constantly reminded of the welcome their ideas will receive by posters such as that shown herewith, placed throughout the shops.

This plan-which has brought more than 14,000 suggestions in its ten years of operation-is based upon cooperation between the employees and Receipt of every sugthe officials. gestion is acknowledged immediately. Employes are advised as to the disposition of their ideas and each suggestion is treated with confidence by In addition to money the Bureau. awards and other forms of recognition, special cash prizes are awarded for the best three suggestions adopted during each six months period, these being \$100, \$50 and \$25 in the order given.

The "co-operative" plan of the Baltimore and Ohio Railroad has won national recognition and has proved to be one of the most successful ever devised by any organization for this purpose. It has been in effect for

about 15 years. It is a logical ment between management employees that it is better to constructively together in a faway than it is to harbor surand dissatisfaction concerning conditions on the one quality production in the shope the other.

Committees are formed in each vision of the shops to handle matter pertaining to that part of the shand, in turn, present them to the management.

Some time ago, following the covery of a considerable number of regularities in the conditioning of comotives and cars in one shop, Superintendent of Shops asked various shop foremen and the repusementatives of the employees serving on the cooperative committees to make a special effort to reduce the number of such irregularities.

The Shop Crafts' representative thereupon entered a memorandum i the minutes of their meeting, attesting their desire to do everything possible to this end, and as the first step requested the chairmen of the crafts to discuss the matter at meetings of their locals and to ask for full cooperation. As the next step, they requested that in the future a chart be made of the specific irregularities so as to give visual evidence of just what was causing the most trouble. also arranged to have these charts discussed at future cooperative meeting and to make a systematic effort. bring about a reduction in the ber of complaints.

At each of these regular meets of shop men twelve points are to cussed in the following order:

- Cooperation between departments.
- 2—Proper storage and care of materials.
- 3—Distribution of material and fuel.

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- 4—Tool equipment and distribution of hand tools.
- 5—Grouping of machine tools.
- 6—Machine operation and crane service.
- 7—Scheduling work through the shops.
- 8—Classification and handling of freight and passenger car repairs.
- 9-Methods of making repairs.
- 10—Methods of handling and disposition of scrap.
- 11—Inspection of scrap and disposition of reclamation of usable material.
- 12—Conditions of shops and shop grounds.

This plan of discussion would be ideal for any type of shop meeting. It is daily producing results in B & O shops because it sets the men at these meetings to thinking about each of these specific opportunities for improvement or saving in logical order and concentrates their thoughts upon one group rather than to permit them to scatter their thoughts ineffectively.

Many tools and machines have been developed from this plan. One is a trepanning tool used in blocking out side rods for brass fit. The drawing shows dimensions and characteristics After sections have been of this tool. forged, slabbed, milled, and so on, a 2%-inch hole is drilled for the arbor used in milling the contour on the The pilot or trepanning tool ends. was designed for a free and easy running fit in this hole. This pilot sets the work up in proper position to be clamped.

It has also been found that much better results have been obtained by cutting half way through the rod from either side. This eliminates the necessity of having such a long cutting tool and also overcomes the strain on the tool. The blocking-out tool is set to leave one-sixteenth of an inch for a finishing cut. In making the finishing cut, the blocking out tool and bar

are removed and the finishing and inserted in the pilot. The slot in pilot for this tool can be seen.

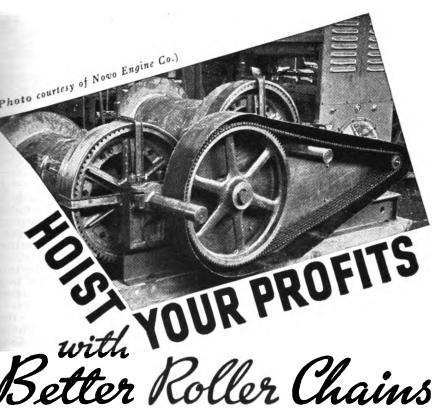
A second tool, developed all through this system, is a tool that a designed for truing the trunion beings on link plates. It can be a in a drill press with a considera saving of time over that requivement performing this operation when performing this operation when the profitably performed by use of this tool.

It will be noted that the cutt tool extends into the offset main be of the tool, which is provided with No. 4 Morse taper shank to fit drill press spindle. The cutter pivoted at the upper end on a %-ipin, and ½-inch adjustment of cutting point is obtained by mean the two set screws shown. This allow adjustment of the cutting property for bushings of different sizes.

Another machine was a pipe-being machine, portable, and construe on a sturdy four-wheel truck of dissions similar to ordinary shops trusted in handling material. As shaper bed was used as a base the slots of which were mounted to rollers or dies. These rollers are justable and have radii suitable bending different sizes of pipestandard 12 by 12-in. air brake of der furnishes the power and is a sted by an engineers' brake with this simple but effective.

These ideas, inspired by the gestion methods referred to, are a few of the many that railroad have secured through the cooperator of their mechanics.

The plans as used by these rainshops need little change to fit machine shop anywhere, small. They offer a lead to a dideas that will make work in the easier and more efficient as more profitable.



When the biggest manufacturer of building hoists in the country standardizes on Baldwin-Duckworth Roller Chains—for all models—there's some good reason. In this case it was the definite proof that a reliable roller chain drive was lower in altimate cost, easier to adjust and more compact than any other method of power transmission.

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Metallizing in the Custom Shops

A Few Case Histories Presenting the Advantages of Metallizing in the Saving of Time and Money.

BY CHARLES BOYDEN

THE operator of the unloading crane for the Stewart Sand and Gravel Company discovered that the 7½-in. diameter center pin shaft was so badly worn that it was in imminent danger of failure. This shaft is an important part of the operating mechanism of the crane, and no chances could be taken on the possibility of damage to other parts of the crane; still, the delay necessary for a new part to be obtained would mean a distinct loss in time and money.

The suggestion was made that the worn part be built up by Metallizing. The pin was removed and sent to a jobbing machine shop where equipment for this work was available, and the necessary metal was applied. This repair was made about a year ago, and the pin is still giving perfect service. In this case the delay was shortened to a few hours and the saving in cost was considerable.

The salvaging of equipment by the use of the Metallizing process is becoming a real factor in the industrial world. It is only within the last few years that the possibilities of this method have been recognized, but a

concerted effort is now being made to acquaint the public with the economic advantages that are available through the use of the metal spraying process.

The use of sprayed metal coatings for combatting corrosion, however, are by no means new. The use of the process for this purpose has been popular for a number of years, and manufacturers and engineers have taken advantage of its possibilities. But more important still is the reclamation of machine parts, because of the direct saving to be made over the cost of replacements, not to mention the time saved in many instances where the repair is quite a distance from the source of parts supply.

In spite of modern automatic gaging equipment and frequent inspection, it sometimes happens that work will be machined undersize. An example of this is found in the load of work-pieces shown in Fig. 1. These parts are shafts with gears cut integral. Due to an error in reading the drawing or in setting the tool these pieces were machined under-size. A few years ago the entire lot of pieces, would have been relegated to the scrap



Fig. 1 — After being finished undersize, the shafts on these gears were built up by Metallizing so that they could be runned the standchined to stand



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pile—but not today. The shafts were quickly built up by Metallizing to the necessary size for remachining, and thus were saved. It is quite evident that the cost of manufacturing such a part as this is no small item, and inasmuch as the expense of building up the metal to the original size was comparatively small, the saving is obvious.

The example given in the preceding paragraph has been used to show that Metallizing is not confined to the salvaging of old parts, but is often a means of saving new parts on which errors have been made in machining. Practically any piece, large or small, can be reclaimed.

The Sinclair Oil & Gas Co. have a 750 h.p. two cylinder Diesel engine with a crosshead pin bearing which is 7½-in. inside diameter and about 9 in. across the face. This bearing had become worn and needed replacing or repairing and it was decided to build it up by Metallizing. Diesel Marine Babbitt was used and the build-up was about ¾ in. on the diameter. The job has been in service for some time and is entirely satisfactory.

Building up bearings is a field which offers great possibilities in large in-



Fig. 3—The degreasing tank shown here is been coated with zinc as a protection against corrosion.

dustrial centers. Bearings built up by the metal spraying process, using equipment such as that shown in Fig 2, have no blow holes and do not necessitate a complete rebabbitt job. The service offers a considerable saving both time and money.

Degreasing machines are used many industrialists for cleaning from their product. The cleaning fluids used in connection with process sometimes cause a certal amount of corrosion, however, and these installations run into considerable money in many cases, meaning used to prolong the life of the equipment. The illustration Fig...

shows a tax which is part of degreasing installation. This take has been could with zinc, to the solution. It has foot. It has found that it gives splatt protection and



Pig. 2 — Metallizing remipment in operation appraying a cesting of babbitt on the interior wall of a large bushing.



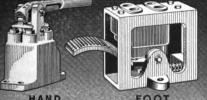
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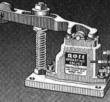
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is now standard practice with some firms specializing in the manufacture of this equipment to zinc coat all their installations.

Linde Air Products Company had an exygen compressor rod which had become worn, from constant use, to such an extent that a replacement or repair was necessary. Inasmuch as an extremely hard wearing surface was desired, it was decided to build up the rod by the metal spraying pro-

bon coatings by grinding because their great hardness.

The Kansas City Light and Portion Co. had a shaft 10½ in. in diameter which was a part of a Westinghasteam driven turbine. This stanceded refinishing and was Metallic in November, 1935. Since that time has been giving perfect satisfacts It can readily be appreciated that thin sleeve of metal sprayed on to shaft of this diameter would cost

finitely less that new shaft. It in such cases this that Metalling is at its be

The illustrat Fig. 4 shows compressor cra shaft being con with 120 carl steel on the cra pins and journ The bearing s faces on crankshaft much more sal factory toda than they when the cran shaft was ma The extreme hard surface w give the man mum of wear. has been prove

in many instances. In one of the large western cities practically all the crankshafts used in the buses of transportation company were rebuilt in this manner. Tests which have been carried on proved conclusively that the amount of wear was comparatively negligible when the shaft were built up with high carbon steel.

Swift & Company had repairs mad on a large ice machine cylinder. The cylinder was 26 in. in diameter and was badly scored at the ends of the piston travel. Monel metal was

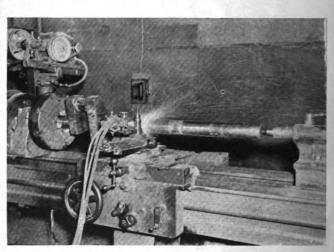


Fig. 4—Coating the crank pins and journals of a compressor shaft with carbon steel. The hard surface thus applied will give a maximum of

cess. Metco No. 2, a high carbon chrome steel, was used for the purpose, and after the rod was finished it was immediately put into service. After having been in use for more than four thousand hours, the rod was inspected and showed 0.002 in. of wear.

This is a case where a repair was less expensive than a replacement and more satisfactory because of the hard surface which was applied to the face of the rod. It might be mentioned that it is necessary to finish high car-





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sprayed into the scored places an after being finished off, the machine was assembled and immediately purinto service. After a year's running it was torn down for inspection, which disclosed the monel repairs to be in the same condition as when they were made. The charge for this job was nominal and effected a saving to

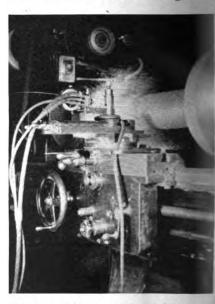


Fig. 5—Applying a coating of high carbon chrome steel to one of the large centrifurd shafts used in the Tennessee Valley Project. The new shafts are machined 1/4 in. undersize and then built up in this manner to provide protection against wear.

Swift Company of approximately \$1000.

The rotors and vanes of the vacuum pumps owned by the Kansas City Water Department were in need of repairs due to corrosion. The vanes and rotors were coated with lead and

the rotor shafts with stainless steel and the pumps were ready for service again. The cost of this job was \$100 as against \$600 for a new pump.

Before the shafts of the large cen-

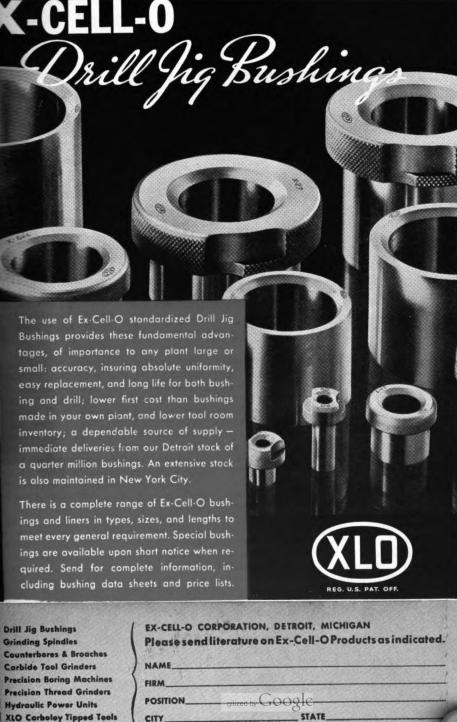




Fig. 6—Cast iron bushings being built up with 1/16 in. of low carbon steel. Reclaiming the bushings in this manner is much cheaper than making new ones.

trifugal pumps used in the Tennessee Valley Authority project were installed, they were coated with high carbon chrome steel. Government engineers specified Metallizing on these shafts as a safeguard against rapid wear inasmuch as the service is severe and uninterrupted operation is of major importance. One of the shafts is shown in Fig. 5. In this case only that portion of the shaft which is subjected to unusual wear is coated. The new shafts are cut 1/4 in. undersize and then built up. As stated previously, these high carbon coatings are so hard they can only be finished by grinding, so it would be commercially impossible to furnish solid shafts having similar hardness characteristics.

Coatings as thick as 3/16 in. are the exception and not the rule, but a number of Diesel engine crankshafts taken from Caterpillar tractors have been built up this much on both the crank pins and journals. Like other shaft applications, 120 carbon steel is used to give the hard surface needed

for this hard service The cast iron bushings shown in Fig. 6 are being built up with 1/10 in. of low carbon It might ap steel. pear that it would be less expensive to make new bushings but it has been found that a grea deal can be save by building up wit the Metallizing pro cess. This is only single instance o bushing reclamation as thousands o bushings of all kind and description have been built u and all are givin splendid service.

Of particular interest is the hard surfacing of shafts by the Metalliz ing process. It is not uncommon for purchasers of new mechanical equipment to have the shafts built up with Tufton or Metco No. 2 wire as a means of increasing the time between shut-down periods. These hard surfaced shafts have approximately three times the bearing surface life of the ordinary shaft and it is a genuine economy to have this application made.

The applications mentioned in this article are typical of the variety of work that enters the average Metallizing shop. Picked at random from all quarters of the country they show what is being done to combat wear and corrosion.

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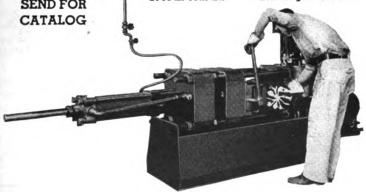
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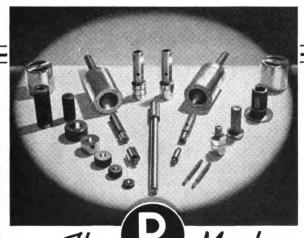
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If Your Motors Have Bal Bearings...

Here are a few hints on taking care of

By W. R. Hough

Experimental Engineer, The Reliance Electric & Engineering Co., Cleveland, Ohio

PALL bearings in electric motors require so little attention that only too often they get none at all. Nevertheless, they do need reasonable care, and the following suggestions may help to avoid unnecessary trouble.

Selection of Lubricant

The manufacturer of the motors is in excellent position to advise regarding the best lubricant to be used for a specific type of machine, due to the fact that he has usually had a great deal of experience and knows exactly what the various kinds of lubricants can be depended upon to do. An ideal general-purpose grease, however, would have the following characteristics.

First, it should have a melting point



Fig. 1—Before repacking a ball bearing all dirt should be wiped off the outside of the bearing housing.

of around 300 deg. F. Second, the grease should be non-fibrous in tex-

ture, free from dirt, and should approximately the consistency of nary butter when the motor is at normal working temperature. This



Fig. 2-Grease should not be packed above lower surface of the shaft.

its ingredients should be so intimate mixed and proportioned that it is no tendency to "separate out" in sto age. Fourth, it must have a minimu tendency to oxidize, corrode, or "gu up" the working parts. So litt grease is needed during the year the good grease, of the correct grade, wi be found a real economy even thoug it may cost a little more per pound.

Repacking Bearings

Regardless of the kind of used, a portion of it will hard become dirty in the course of time consequently the old grease should removed, the cups cleaned out new grease packed in at regular tervals. This should be done one.

(Illustrations Courtesy The Reliance Electric & Engineering Co., Cleveland, Obio.)

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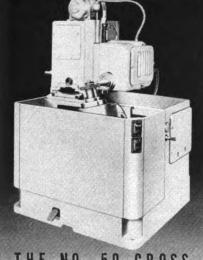
Spraying Babbitt Metal

Libby Welding Co., Kansas City, Mo., reports: "Enclosed photo of Metallizing (spraying babbitt metal) illustrates a service to our customers that has increased our regular business and added profits. We are sold on Metallizing, the Mogul gun and the service obtained from your company. Every up-to-date shop should have this equipment even tho they do only two small jobs a month."



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THE NO. 50 CROSS

A Universal Gear Chamfering Machine for producing any form on internal and external gear teeth with a "pencil-point" cutter. Spur, helical, herringbone or, gears with relieved teeth are all chamfered with equal ease. Controlled automatically-set-up quicklytooled economically.

Information sent on request ROSS GEAR & MACHINE CO. stablished in 1898 DETROIT, MICHIGAN, U.S.A.

year, or, at least, every two years.

The first step is to wipe the outsiof the bearing housing so as to remove all dirt, otherwise some of



Fig. 3—If the bearing is packed too full of grease—like this—the increased friction solution to overheat.

will be almost certain to find its was inside during the packing proces-Next, remove the cap and clean all the old grease out of the ball races an off the balls. Then wash out the bear ing thoroughly, using some solver such as carbon tetrachloride or gasline. However, since most solvents be come corrosive in the course of time every trace of the solvent must be removed afterward by flushing out wit



Fig. 4—If a paper gasket was used by the manufacturer, be sure it is replaced in the cap before sealing up the bearing.

clean, light lubricating oil before the bearings are repacked.

Care should be taken that the nex grease is thoroughly clean. A little dirt can do a surprising amount of damage; in fact, it is claimed that



Years of accumulated experience in the designing of standard and special cutting tools is at your disposal without obligation. Write for a catalog of the Gairing line on your company letterhead.

Gairing representatives are located in all the important industrial centers.

Manufacturers of STANDARD and SPECIAL CUTTING TOOLS and TOOL HOLDERS Counterbores and Countersinks . . . Counterbore Sets, Spotfacers . . . Core

Drills, Reamers, Hollow Mills... Full Floating Holders, Facing Heads... Form Cutters, Boring Bars, Boring Heads ... Adjustable Extension Holders . . . Multi-Diameter Cutters . . . Tungsten Carbide Tipped Tools.

WEST LAFAYETTE • DETROIT, MICHIGAN

dirt alone is responsible for some 90 per cent of all ball bearing failures. The bearing should not be packed too full; up to the lower level of the shaft



Fig. 5—When repacked, the rotor or armature of a ball or roller bearing should turn easily by hand. Hardened grease or mechanical binding may prevent this.

is enough, otherwise the friction will be so much increased that overheating may occur. When the bearing is completely reassembled, a final check should be made to make sure that the motor armature (if of average size) can be revolved freely by hand, and if spun will come to rest gradually.

A little care used in repacking will go far toward eliminating shut-down

Wall Chart of S. A. E. Color Code

To aid in quickly and accurate identifying S.A.E. steels, a simple at practical color chart known and maketed as the S.A.E.-Namel Chart been developed by Mill Service, P. Box 763, Springfield, Ohio. The chillustrates in detail the Color Code Marking Steel Bars recently promigated by the U. S. Department of Comerce, Division of Simplified Practical National Bureau of Standards.

The color chart is 22x36 in, in su and can easily be read at a consideral distance. The chart lists, by SAE ste numbers with corresponding color conumbers and color combinations, all the 89 S.A.E. steels included in the color code as officially promulgated. The chart is intended for use at cutto tables as well as by receiving, shippin matallurgical, sales and purchasing a partments. Write for a copy.

NEW

U. S. No. 1 Anti-Friction Bearing

Hand Milling Machine

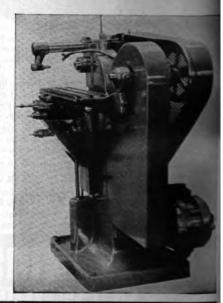
The New U. S. Hand Miller is particularly adapted to high speed light milling operations. Vertical and horizontal feeds.

Improvements: Heat treated chrome nickel steel spindle, Timken bearings, Ballbearing countershaft, V-belt drives, 6 Spindle Speeds up to 1592 R.P.M., providing efficient use of small end mills.

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The UNITED STATES MACHINE TOOL Co.

1954 W. 6th St. Cincinnati, Ohio





Pocket Size

Wrenches, Billings Vitalloy and Carbon—Shop and Maintenance Forged Tools! The New Billings Catalog with the bright red cover. You'll want one. Ask your distributor or write d:rect to Dept. "O".

THE BILLINGS & SPENCER COMPANY HARTFORD, CONN. U. S. A.

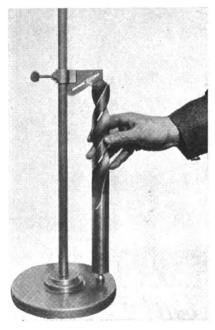
Ideas from Readers

This department is a clearing house for ideas . . . If there is a "kink" or short cut in use in your shop, send in a description of it . . . Each one published will be paid for.

Drill Grinding Gage for Large Drills

By R. B. LOVELAND

IN order to ensure the correct grinding of large drills at the Roanoke Shops of the Norfolk & Western Rail-



The use of this gage makes it possible to instantly determine whether or not the drill is ground at the correct angle and whether the lips are of equal length.

road, the gage shown in the illustration was developed. The tool is as simple as it is efficient, consisting of a circular base from which extends a vertical spindle carrying an angle gage.

A slot is provided in the angle through which extends a threaded stud attached to a stop which can be set for checking the length of the lip A nut on the threaded end of the stud provides for locking the stop in position. The angle can be adjusted for height and then anchored by means of a thumb screw. A center is located in the base, in direct line with the "V" in the angle.

To gage the accuracy of the grinding of a drill, the center hole in the end of the shank is slipped over the center in the base of the gage, the the angle is adjusted so that the "V" will fit snugly over the point of the drill. As the angle is made to the correct grinding angle of 59 degrees, the accuracy of the angle of the cutting edge can instantly be determined. If the angle is correct, the stop is set in contact with the side of the drill at the corner of one lip, then the drill is revolved to bring the opposite lip into alignment with the angle. If one lip is longer than the other, this fact is immediately apparent.

Saw Filing Attachment for the Shaper

By C. F. FITZ

BEING saddled with the job of keeping a large number of hard saws in good condition without the sid of a saw filing machine, necessity again became the mother of invention



rigid saw frames, hold blades at greater tension—assure straight cutting. All controls are set in front for convenience and safety, and frame slides in "V" bearing that have screw take-up to compensate for wear.

They are in every way "more saw for the money."

Equipped with unbreakable Hack Saws can be counted on to keep producing hour after hour, day after day.

ARMSTRONG-BLUM MFG. CO.

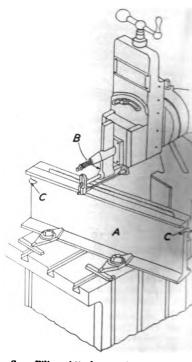
"The Hack Saw People"

5745 Bloomingdale Ave. CHICAGO, U. S. A.





and we designed a saw filing attachment for the shaper. The attachment consists of the vise shown as A in illustration and the file holder B. To vise was made from a section of 8-inchannel iron in which a slot was millustrationally just wide enough to provide the section of the section of 8-inchannel iron in which a slot was millustrationally just wide enough to provide the section of the section of 8-inchannel iron in which a slot was millustrationally just wide enough to provide the section of the section of



Saw Filing Attachment for the Shape

vide a slip fit for a saw blade. The file holder was built out of an interest shaping tool.

To use, the handle is removed, the hand saw and the saw is discontinuous in the vise. By the C-clamps indicated as C, the in the angle iron can be made to the saw and hold it rigidly. This clamped to the machine table angle shown, in order to the proper clearance to the cutting of the saw. The file is also set

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AFTER



an angle; that is, with one end higher than the other, so that only a small cut is taken on each tooth. This produces a cleaner cut, reduces the strain on the file, and by thus reducing the wear on the file makes it last longer. It also provides sufficient clearance at the end of the cut so that the saw can be fed to bring the next tooth into filing position.

Before starting the operation, it is necessary to count the number of teeth per inch on the saw. If there are 16 to the inch, the automatic feed of the shaper is set at 0.0125 in., due to the fact that every other tooth is filed at this angle and this setting of the file. When the teeth have been filed in one direction, the saw is turned end for end and the operation is repeated, fil-

ing the rest of the teeth.

The attachment is used for filing all types and sizes of saws and works out very well. It is interesting to note that the men who use the saws say that saws that are filed on the shaper hold up better than those that are filed by hand. The attachment has saved a considerable amount of time and effort.

Simple Jig for Drilling Locomotive Rod Bushings

BY G. F. CAGLE

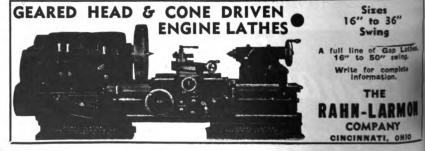
THE jig shown set up for use in the illustration is one of a set of similar jigs in use in the Macon Shops of the Central of Georgia Railwa for drilling holes in main and sid rod bushings. There is a jig for eac size and type of bushing, each jig be

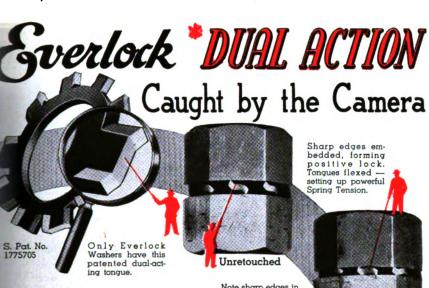


Simple Jig for Drilling Locomotive Main and Side Rod Bushings

signed for drilling from 40 to 60 holes, as the case may be.

The feature of the jig is its extremely simple design, the jig consisting only of a steel ring containing the necessary drill bushings. work-piece is slipped into position





*POSITIVE LOCKING AND OWERFUL SPRING TENSION

To keep screws and nuts tight requires to definite principles:

- Powerful Spring Tension set up by e flexing of many tongues.
- (2) Positive Locking by sharp projecting dges on tongues that dig into the working urfaces.

These pictures show how Everlock Tashers afford this dual action—show hy you can depend on Everlocks to duce complaints and service calls wherever nuts or screws are used.

FREE SAMPLES mailed on request. Just becify sizes you want.

hompson-Bremer & Co. 640-H W. Hubbard St. CHICAGO Note sharp edges in contact with surfaces—tongues set for flexing when nut is tightened.

Released — tongues back to original position—definite evidence of powerful spring action.

Only Everlock Washers make these long, deep indentures — definite evidence of locking so positive that only a powerful wrench can release the nut.

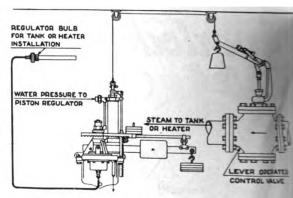


Unretouched

Specifical Action LOCK WASHERS

from the end and usually fits snugly enough to prevent movement in the jig. All holes are 5/16 in. in diameter and after the drilling has been completed, the piece is removed from the and the holes are countersunk in the usual manner, the V-block only being necessary.

Temperature Control in the Machine Shop



Drawing of device for automatic temperature regulation

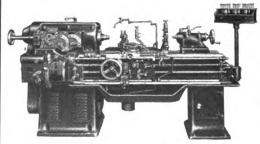
By W. F. SCHAPHORST

N these days of automatic controls that are actuated by air, water, steam, heat, and so on, the question is often raised as to the best method of controlling valves, gates, and other regulating devices automatical through slight changes of tempera-The accompanying drawing illustrates the design of an excellent device for this purpose.

The regulator bulb is placed in the

SIDNEY

PRECISION TOOL ROOM LATHES



 New features include Quick-Change Gear Box —a separate, enclosed unit, tongued, grooved and bolted to the front of the bed. All shafts in gear box and on quadrant operating on anti-friction bearings. 48 complete thread and feed changes without the use of extra gears.

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THE SIDNEY MACHINE TOOL CO

NORTON ABRASIVES

VARIETY—in abrasive and bond—that's one reason for Norton success in every cutoff operation.

EXPERT SERVICE is another reason—experts who can help you adapt them to your job.

Abrasive wheels are now recognized production tools for cutting-off and slotting operations—are doing the job more economically than other methods and leaving a finish that eliminates subsequent operations. Let Norton show what they can do for you.

NORTON COMPANY WORCESTER, MASS.



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tank, heater, or gas passage that is to be regulated, where any change in the temperature is reflected in the transmission of a slight force to the intermediate regulating device in the center. Then, by means of water pressure from the city main or elsewhere, this central device—which has been "touched off" by the slight pressure change—goes into operation and, by means of piston and cable, operates the valve, damper, or gate without human aid. The device works backward as well as forward, the counterweight doing the closing.

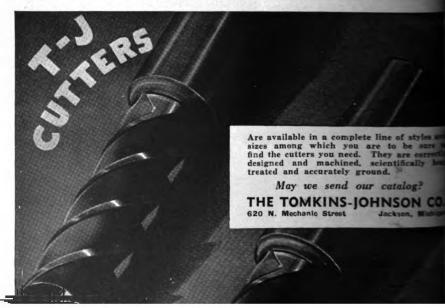
As an example, the drawing shows the device connected to a large lever-operated control valve. Attempts to handle steam valves as large as 8 in. by temperature regulation alone usually result in failure. With the aid of the device shown here, however, it usually can be done, although it may be necessary to develop a special opening and closing lever such as

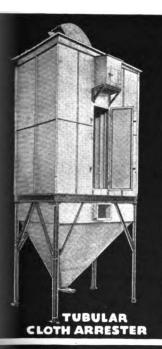
the one shown here. The arms ment shown works very satisfactor, and assures automatic temperature regulation within close limits.

Handy Indicator Holder

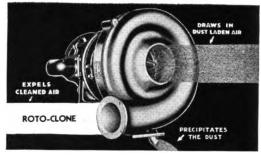
By F. F. CHARLES

N indicator holder which can used on any machine where holders are used and which sa time by eliminating the step of I moving the tool holder in order indicate the work in the machine shown in the accompanying illust tion. It consists primarily of a sha A which is cut from square stock the same size as the tool bits w in the tool holder of the particular machine, and a yoke D which threaded on one end and slotted the other end to receive the prop tion on the back of the indicator. ball B is turned, then drilled









The TRIUMVIRATE of Dust Control

THE Roto-Clone single unit blower and dust separator now available in 3 types, saves space, piping and power. Combines the functions of an exhauster and cyclone separator ordinarily used for eliminating a dust nuisance. Where re-circulation of air is practical, Roto-Clone is most effective in combination with either AAF Tubular Cloth or Airmat Dust Arresters.

THE AAF Tubular Cloth Dust Arrester is especially designed to collect fine granular dusts and handle large volumes of air. Its newly developed and very effective vibrating mechanism and built-in pre-cleaner make it most economical for larger installations.

THE Airmat Dust Arrester is particularly effective with process dusts including fibrous, linty as well as fine granular material. Its unit construction makes it economical for small installations in the form of dust "boxes" as well as for larger installations where central systems are required.

Write for complete information and engineering data.

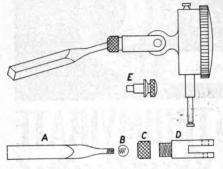
AMERICAN AIR FILTER CO., INC.

Incorporated

342 Central Ave., Louisville, Kentucky In Canada: Darling Bros., Ltd., Montreal, P. Q.



threaded as shown in the illustration. A nut C is threaded and then bored to form a ball and socket joint for the ball B to ride in.



Handy Indicator Holder

The yoke D is bored at the threaded end to complete the other half of the ball and socket joint. A screw E is made to hold the indicator in the yoke of the holder. All parts of this holder are heat treated so as to provide har wear-resisting surfaces. The easy with which a holder of this type or be adjusted in the tool holder and the time that it saves fully compensation the time and labor required to make one.

Timken Seamless Mechanical Tubles. For the convenience of those specify and using seamless mechanical tubles and using seamless mechanical tubles. The Timken Steel and Tube Division is assembled a handy pocket size handbod 4½x7 in., listing standard tolerans mechanical properties of cold draw carbon steel seamless tubing, theoretic weight per lineal foot of seamless tubin from ½ in. OD to 10¾ in. OD and we thicknesses ranging from 0.004 to 1½ in Conversion tables and standard seamle steel pipe size tubing tables, with a summary of standard definitions of tem used in connection with tubing specifications, are also included.

Copies of this booklet may be secure free upon request to The Timken Sta and Tube Division of The Timken Role Bearing Company, Canton, Ohio.

Only the

PROCUNIER UNIVERSAL TAPPING MACHINE

has all these features

Five speeds, ranging from 385 to 2240 R.P.M.

Tap capacity from No. 8 to 5%" using two interchangeable heads.

Pre-set feeding and backing out pressures, independent of operator, uniformly maintained through long helical springs with wide range of adjustment.

New protection of taps with Procunier Sensitive High Speed Tapping Heads.

Automatic lubrication of tap with accurate timing and volume adjustments.

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PROCUNIER SAFETY CHUCK CO. 12 S. Clinton St. Chicago, Illinois



The Bijur Automatic Lubricating System automatically feeds any number of bearings the metered oil film each requires. Maximum protection for machine life! Bearings, slides, gears . . . lubricated correctly, economically. None forgotten. ● Insure high-speed runs with new-machine accuracy. Avoid expensive production delays. Cut maintenance costs. Protect your investment! . . . With BIJUR.

BIJUR LUBRICATING CORPORATION LONG ISLAND CITY, NEW YORK

Over the Editor's Desk

Communism

ARGELY as a result of the flood of labor troubles that are upsetting the country, we are hearing more and more about Communism and the fight that must be made to prevent it from spreading in this country. Communist literature is suppressed and steps are taken to prevent speakers with Communist leanings from airing their views in public. All of which indicates that we are afraid of Communism. Are we? If so, what is this thing that we are afraid of?

Communism is a theory regarding the manner in which government should function, just the same as Dem-A Communist is not necessarily a criminal, with a pistol in one hand and a torch in the other. He is a human being, even as you and I, who believes that the best form of government is one based on the common ownership of the equipment and materials necessary for production and an equal distribution of the products of industry. As long as he advocates his theories peacefully, he is as entitled to his beliefs as an advocate of the republican form of government is to his. The Constitution guarantees the right of free thought and free speech to every one, as long as he abides by the laws of the country.

The majority of us in these United States may not be in sympathy with the Communistic theory; we may feel that the system holds no incentive for extra effort or brilliant thinking and thus tends to kill initiative, or we may feel that the success of this Utopian theory depends upon absolute unselfishness on the part of each and every individual—a state of perfection which we are far from achieving. Whatever defects we may attribute to the Communistic system, we are taking a decidedly unintelligent attitude when we try to eradicate it by suppressing any reference to it. On the contrary, it should be placed in the spotlightin the full glare of publicity—and that without delay. If Communication right, it will triumph in the end way, and no power under Heaves can prevent it. If it is not the best method of government for us, we are stupic and ineffectual if we cannot prove our point openly.

The ideas by which the destiny of this country will be guided ten, twenty, or thirty years from now are now in process of crystallization in the mind, of our children. We are neglecting our duties if we are not making a definite effort, now, to see that these children are thoroughly grounded in the principles upon which our government is founded so that they can judge for themselves as to whether or not the republican form of government provides the utmost in opportunity for

The majority of our presidents was sons of comparatively poor families; Rockefeller was a poor boy; Schwak was a mill-hand; Ford was an ordinary mechanic; the majority of our railroad presidents began as ordinary workmen, and so did the presidents of most of the great steel corporations. Any boy can go just as far up the ladder as his intelligence will carry him. What more could any one want?

Under our form of government the United States has grown to be what we, its people, believe to be the greatest nation of the earth. For one hundred and sixty-two years our country has progressed and today is stronge: than ever before. If we feel that Communism or any other "ism" is a menace, the intelligent way to handle the situation is to see that the youth of the country are fully educated regarding all forms of government, include Communism and Fascism, so that will have a clear understanding both sides of the question. With knowledge, if they wish the form government changed, it will be them when the country is in hands. And if they do not was changed, they will be properly pared and equipped to prevent it

THE FINEST BALANCE

REQUIRES THE FINEST

ENGINEERING

Allis-Chalmers engineers now set a new high standard in DYNAMICALLY BALANCING Sheaves for TEXROPE V-BELT DRIVES. Over their entire range of speed, up to 6,000 rpm. these sheaves have no vibration period...they run like a watch movement from 1 rpm. right up to 6,000 rpm.

Allis-Chalmers has made the DYNAMICALLY BALANCED SHEAVE commercially available for applications that require the most extreme accuracy and precision, and can therefore tolerate no vibration at any time or at any speed.

Your V-BELT drive applications may not require

such fine balance, but whatever TEXROPE V-BELT DRIVE equipment you buy will have the same caliber of engineering ability and experience built into it, that produced the ALLISCHALMERS DYNAMICALLY BALANCED TEXROPE SHEAVE.

Write for Vari-Pitch Bulletin No. 1261-A

Belts by Goodrich

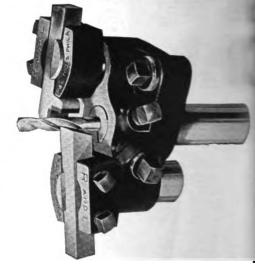
ALLIS - CHALMERS



TOOLS

The R & L Turning Tool replaces an assortment of fourteen tools-at a saving of \$235.

And you CONTINUE to save money, because the R & L Tool can do one, two or three jobs at one time. It can be used for drilling and turning at one drilling or reaming.

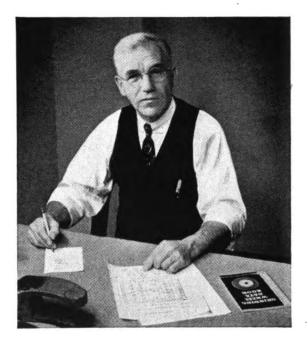


operation, for turning and centering, for turning two diameters while

Altogether you save \$235. plus increased production profits by using R & L Tools. Write today for information.

R& TOOLS 1825 BRISTOL STREET

That about rinding ? OSTS?



LIKE most plant men—you're probably not entirely satisfied with your present grinding figures.

Cost of grinding, though, can often be controlled by

investigation of the grinding wheels you use.

Results of recent tests in many users' plants lead us to believe that ABRASIVE COMPANY GRINDING WHEELS can be adapted to your requirements after investigation by our sales engineers so that your costs may be materially reduced.

We will be glad to send specific information at your request.

ABRASIVE COMPANY

GRINDING WHEEL DATA BOOK

Write for your copy of this helpful service book full of practical information about grinding. Tacony & Fraley Streets PHILADELPHIA, PA.



New Shop Equipment

Cincinnati Heavy Duty Frog and Switch Planer

A heavy duty planer primarily designed to machine frog and switch products has been placed on the market by The C.ncinnati Planer Co., Cincinnati, Ohio. The planer is furnished in two

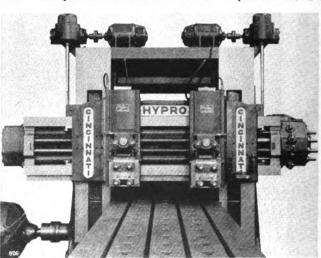
Automatic graduated feeds ranging from 1/96 to 9/16 in are provided to both the down slides and cross saddles and are operated through a magnetic clutch. Rapid traversing to these toolholding heads is another important feature for quickly positioning the tools Rapid traverse is accomplished through

the use of two motors mounted on top of the michine, as illustrat-One motor for vertical movement of the slide and the other for lateral movement The motors me only when travers ing is required and each motor is controlled by the reversing drun switches mountain near the operator the right hand side Pneumatically-operated tool liften relieve wear on the cutting tools on the return stroke of the table.

According to the manufacturer, the construction of the clapper box and tool block makes these parts capable

of withstanding heavy cutting pressures. An abutment on the tool block relieves upward bending strains on the clapper box taper pin. Angular adjustment of the tool is obtained by a worm and wheel engaging in teeth cut from the solid tool block. This arrangement is said to give very satisfactory resistance to all side strains.

The housings, which have ample support to the bed, are of the "pyramid" type and are flanged at the base, allowing means for both leveling and clamping to the foundation. The bed is rigid in design and is made at least twice the length of the table, thus eliminating overhang of the table throughout its stroke. The gearing in the bed is so designated that side thrusts are eliminated through the use of double helical



Cincinnati Heavy Duty Frog and Switch Planer

standard widths of 42 in. and 48 in. between housings.

The maximum height under the cross rail is 241/2 in., thus providing extra space for satisfactory work-holding fix-tures and also for the gradual increase of the rail sections. The cross rail can be permanently located on the housings dowel pins or, if necessary, power elevation can be provided through the use of a 5 h.p. standard N.E.M.A. frame motor mounted on the top of the ma-chine. The cross rail is made of box section, well ribbed throughout to resist all strains imparted through the cutting The rail heads which mounted on the cross rail are square gibbed. Each head has independent feed rods, and is operated only from the right side of the machine.

g to the bull pinion. The table s can be readily arranged to suit t fixtures. The table rack is of steel keyed and bolted to the box

ed lubrication to all the bearings, ing the table "V" ways, is furas standard equipment. The caof the main reversing driving



ew Showing Operating Mechanism

; from 50 to 75 h.p., giving a n cutting speed of approximately er minute. The motor can be a either side of the machine to customer's requirements.

is Dual Wheel Carriage Type 30 Roll Grinder

problem was brought to the coll Company, Waynesboro, Pa. manufacturer of rolls. It had impractical to turn certain cy chilled iron rolls which had placed on the market. These ined a high percentage of were so tough that turning not stand up. What was re-

rolls and then could be used ish grind them.

1sh was a 36x18-in. Type 30

s a machine which without a

operation,

would

turning

UNSHAKO

SELF-LOCKING NUT

Industry needed a lock nut that could be relied upon to stay tight despite vibration, yet one that could be removed with little trouble if necessary. "Unshako" is

The Built-in Locking Ring won't let it shake off.

the answer... it meets these requirements, and more too.

Mechanics especially appreciate it as it is entirely self-contained... no separate pins or washers are needed. A built-in locking ring that works on the brake band principle holds the nut tight.

Don't fail to investigate "Unshako".



Pat'd and Pat's Pending

CUTOUT SECTION SHOWING RING IN PLACE

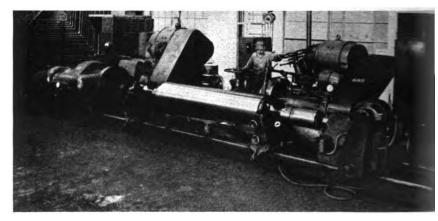
STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA.

Boston Detroit Indianapolis

Box 556

Chicago St. Louis San Francisco



Landis Dual Wheel Carriage Type 30 Roll Grinder

Roll Grinder with an extra long rear bed section. On this section were mounted two grinding wheel carriages. The one was the conventional Landis Type 30 Roll Grinder wheel carriage which was to be used for the finishing operation. The other was a special wheel carriage carrying a wheel head of unusual design which was to be used for the roughing operation. It was possible, due to the length of the rear bed section, to run the finishing wheel carriage to the end of the bed and rough grind with the second carriage over the entire length of the roll without interference. Then the rough grinding wheel carriage could be run to the opposite end of the bed and the finish grinding carriage used for finish grinding over the entire length of the roll.

The roughing wheel is 36x12x18-in, in size. Two 36x6x18-in, wheels a re

The roughing wheel is 36x12x18-in, in size. Two 36x6x18-in, wheels are mounted against each other on the center of a massive wheel spindle. This means that the wheels are carried between the bearings, not on the end of the spindle. The roughing spindle is almost 58 in, long, is 5½ in, in diameter between the bearings and 8 in, in diameter between the bearings. Anti-friction bearings are used. The wheel is driven by a 100 h.p. motor mounted on the rear of the head and driving in the usual manner to the right-hand end of the spindle through multiple V belts. Grinding a roll with a body 79 in, long and baving a diameter of 25 in.

Grinding a roll with a body 79 in. long and having a diameter of 25 in. 150 in. stock is removed at the rate of 8 cu. in. per minute. This is an exceedingly unusual amount of stock removal and it must be remembered that the machine is capable of this per-

formance not just on a test run b continuously. Previous to the install tion of the machine, the customer w rough grinding these rolls on a convetional type of roll grinder. One 30x3x1 in. Vitrified wheel wore out, rough grinding one roll. It seems safe to s that 17 to 18 rolls may be rough groun on the new machine, using the two 35x x18-in. Resinoid wheels.

to terms of Reduced comparati costs, it develops that wheel costs alor on the roughing operation have beconsiderably more than cut in half. course there is the tremendously im portant advantage of only having place the roll in one machine for bo the roughing and finishing operation ' stead of having to move it from machine to another. After rough conventional wheel Carriage brought into operative position and a roll is finished just as on any other Type 30 Roll Grinder. This means the the body may be ground straight, are cave or convex and naturally the nec as well may be ground.

The machine weighs 195,000 pour including all electrical equipment. It all, thirteen electric motors are utilized and their total horsepower is 224½. The roughing wheel drive motor is 100 he the finishing wheel drive motor 75 h. p. and the work drive motors are each 3 p., the footstock traverse motor is 3 p. and the two coolant pump motors are each 2 h. p. The two wheel criage oil pump motors are each ½ p. and the wheel spindle oil pump mount on the finishing bead is ½ h. p. Inclentally, the use of anti-friction ber-

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Equipped with Hannifin improved air cylinders having outside adjustment of the piston packing.

Available in capacities from 600 lbs. to 50,000 lbs., for all kinds of pressing operations.

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finished bore means maximum

power and no trouble with p

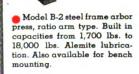
eakage.

Hannifin Arbor Presses are available in a full range of standard types and sizes, for assembling, broaching, piercing, keywaycutting, oilgrooving, straightening, pressing, molding and other production operations. Modifications or attachments can be furnished to suit special requirements. Presses can be equipped with the Hannifin patented oil cylinder speed control where a steady, controlled ram stroke is required.

HANNIFIN Manufacturing company

621-631 South Kolmar Avenue Chicago, Illinois

> Write for Bulletin 36-MM



Model AO-1 Arbor Press. Capacity 2,650 lbs. Cylinder position adjustable in frame. Also built in other capacities.

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ings on the roughing head obviate necessity of a wheel spindle oil p motor on that head. No wheel desis required for the roughing wheels they break down properly during ming. Still another interesting point that the roughing wheels may changed while the machine is in midst of a finishing operation, the saving much valuable time.

Numerous unusual electric features have been incorporated into machine. All motors for complete eration of the machine may be trolled from the wheel carriage used. The work drive motor rhees equipped with a motor driven control so that it may be operat the operator's platform on the carriage. The wheel carriage m interlocked in such a manner that one is operating the other cans operated. Because the exceedingly roughing wheel would have a ten to drift for a long period after the drive motor has been stopped, this r is provided with mild graduated dyn braking. A jog switch at the from the headstock enables the operate thoroughly examine the roll front of the machine. Limit are provided to prevent over-tra either wheel carriage or either

Any Landis Type 30 Roll Grinder of be arranged as the machine just scribed. The available swings are 48, 52, and 60 in. and the distance tween centers, depending upon swing, 120 in. to 288 in. in increase of 2 feet.

Oilgear 200-Ton Gooseneck Straightening Press

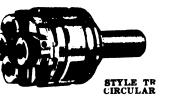
Large front axle I-beams for he trucks and buses are straightened the illustrated New Style 200-Ton Gomeck Straightening Press designed manufactured by The Oilgear Comparison of this press are sturdy, allsteel welded construction; sensitive, almost "human" control the smooth variable ram movement, at the provision for changing the Oilgeum and motor drive when gresspeed and production may be required.

The press frame and motor mount are of allsteel welded construction for plates welded together into a single mand normalized. Plates up to 3 in thickness are used in the main sect of the frame. The frame alone well 2,800 lbs. and required the use of c 1100 lbs. of welding rod in its fabo

ROTARY DIE HEADS







Trim, compact, simply-designed tools like these stand up under the strains of high speed rotary threading. The fewest possible working parts are used, hardened and ground to precision limits. Chasers are held in rigid, solid support, yet adjustments are simple and accurate. The opening and closing action is smooth and sure—no chance for damaged work or tools.

Geometric offers two rotary die heads—the Style KD with regular chasers and the Style TR with tangent or circular Long-Life chasers. (Our Style TR heads requires less "down time"; easier to set up and easier to adjust.) If you cut screw threads on live spindle machines, these die heads will earn profits for you by reducing costs, saving time and eliminating trouble. We have specialized in screw threading machinery and tools—since 1895.

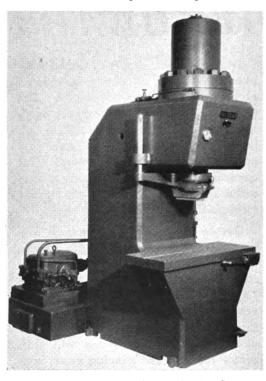
May we send you booklets on these rotary die heads?

THE GEOMETRIC TOOL CO.

NEW HAVEN, CONNECTICUT

tion. The press complete, as shown, weighs about 19000 lbs., is 120 in. high and occupies a floor space of 72x88 inches.

Careful tests after completion indicated a maximum deflection of only 0.025 in. at full tonnage on the centerline of the ram. The ground and pol-



Oilgear 200-Ton Gooseneck Straightening Press

ished press ram is fitted with molded packing and guided in a yoke liner and long bronze bushing. A 13½-in. bore hat-type steel cylinder with closely fitted ring-type piston is flanged to the top of the press. Two seamless steel tubes brazed to flanged type of joints connect pump and cylinder, no control valve being required. The ram is fitted with a sliding ram rose to expedite straightening of special parts.

Nowhere are the advantages of Oilgear more apparent than in the accurate straightening of parts between centers or on V-Blocks. Sensitive control of the smooth, variable ram movement enables

the operator to bring the ram is contact with the work without imput to deflect the piece the desired without overrunning. The ram is always under the instant the operator, regardless of resistant the speed and stroke of the can be pre-set or selected at will

zero to maximum. Pull nage is available at all and the power required a ways in proportion to the resistance met. No oil is delivered by the pump when the

ram is idle.

Fluid power up to 2500 lb per square inch is supplied the Oilgear Type "DH-2025 Two-Way Variable Displacement Pump driven by a 15 h direct connected electric most operating at 1200 r.p.m. Flux power supplied by the large pump will provide a maximur ram speed down of 38 in per minute and a maximum ras speed up to 76 in. per minute at pressures up to 2500 lb per sq. in. depending upon the resistance met. In the meat time operation is at the in

unit. The Hydraulic Servo-Mow control on the Oilgear pum is operated from the hand leve or foot pedal through a simple spring loaded control mechan-ism, so that the operator can start, accelerate, decelerate stop or reverse the ram motion instantly whenever desired Depressing the hand lever of foot pedal causes the ram move down at a speed proporthe amount of to movement of the control. Thus any speed up to maximum 2 obtained at will.

creased economy of the smalle

Other specifications of the press are as follows: stroke maximum, 12 in.; maximum dimensions end of ram to table 26 in.; depth of throat, 12 in.; width of table, 18 in.; length of table, 50 in.; height of table from floor, 36 inches.

Newton Heavy Duty Vertical Profile Milling Machine

The Newton division of Consolidate Machine Tool Corporation, Rochester, 17., has developed a heavy duty vertical Profile Milling Machine which resents decided advances in the handle of profile milling on radius links,

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centric cranks, link cheeks and similar general purpose profile milling of castings and forgings. Simplicity of control and ease with which longitudinal and in-and-out movement of table are obtained are features of this machine. In addition, extreme ruggedness and ability to take heavy cuts smoothly and accur-

NEWTON NEWTON

Newton Heavy Duty Vertical Profile Milling Machine

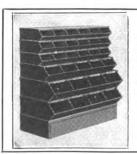
ately permit the machine to perform profiling of difficult contours quickly and efficiently.

Two levers for controlling rate of feed and rapid traverse are located at front of machine within easy reach of operator. One controls the saddle and the other the table. Movement of saddle and table which are by hydraulic screw feed are controlled by banks of push buttons mounted on front of macin-Hand control of table feed and add feed is provided by dials which quitthrough follow valves. When hand at ing, valve centers are moved by a dials and table follows exactly as as dial is turned only, and at the se of movement which can be instantly

or changed by two levers ment before. Kither or M movements table may be 📭 ated in continu power feed and rates of feed with as required w cutting рÀ feed rate control ? or one ment œ may be by power while the hand. The instantly whichever tion is best for conditions at the ment, making # 1 easy and simple ter to mill accura along a row of cent punch marks aroun a prescribed profile

The machine built in the News Unit Head Type to construction, the spindle head and in drive motor bem

as one unit fastened to the upriging spindle is mounted in Timken role bearings and is supported by sleeve with up and down movement for setting the cutter. Variable speed drive motor is mounted on head and drives spindle thru V-belt and quick change grans give a wide range of quickly obtained are used throughout the drive, and a



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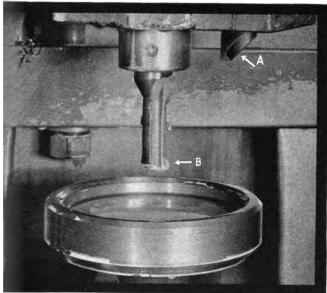


Photo. Courtesy Bulch Motor Company ning operation on driving unit involving multiple diameters. Material: Forging 4640, Brinell 187-207. Operations: Chamfer I.D. 4.429' with V-R, Grade E, photograph) while boring double diameter (.740'-.790') with H.S. Steel (B in photograph). Performance of V-R, Grade E:

d Material	Feed	Depth of Cut	Speed	Pieces per Grind
R Grade E	.0035"	18	340 S.F.M.	800

shop man knows the probvolved in machining multiple ters in a single operation. e, again, Vascoloy-Ramet, intalum carbide tool mademonstrates its superiority me and money saver, by its it operation at the high (340 S.F.M.) on the 4.429 er necessitated by a satisfactoring speed on the .740 er.

luced in 17 standard grades rent tantalum carbide conrength and hardness, V-R alone covers the entire range of machinable materials and machining needs.

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gears are fully enclosed and run in oil. The upright supporting the spindle head is of heavy box section and is securely and rigidly fastened to the base. Work table is of cast steel finished on top with T-slots in both directions and surrounded by coolant trough for draining cutter coolant. Sturdy construction of table permits the clamping of work directly on it, without the use of fixtures and with minimum distortion. Bottom of table is finished with ways to fit cross slide which is also finished on bottom with square lock ways to fit base, thus providing table movement in all directions.

One hydraulic pump connected to two hydraulic motors actuates movement of table and cross slide and each is independent of the other. Feed drive gears are also fully enclosed and run in oil. Lubrication to all essential bearings is taken care of by centralized

oiling system.

The machine illustrated has a work table of 27x60-in. with an in-and-out travel of 30 in. and longitudinal travel of 52 in. with travel equal both sides of spindle. Spindle is 6 in. diameter and spindle sleeve has vertical adjustment of 12 in. Other similar machines can be built in various sizes depending upon requirements.

Hannifin 35-Ton Straightening Press

A 35-ton sensitive straightening pre especially designed for straightening erations on heavy crankshafts has placed on the market by Han Mfg. Company, 621-631 S. Kolmar & Chicago, Ill. The press is equipped the Hannifin single lever sensitive portional control. The ram mor is completely controlled by on and when this control lever is in either direction, the ram will a proportional distance under full sure and then stop. The operating automatically moves to neutral pump idles at zero pressure un other movement of the ram is re This extremely simple control obutes to rapid and accurate has of straightening operations.

An individual hydraulic power unitabilit into the base of the press, man a compact and self-contained instaltion. The table is equipped with scial fixtures, including an adjust carriage which rolls on ball bentable. The supports, which are he mountings on the hardened rails of ened wheels, are provided with spepads. This construction simplifi







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tand tests* made under conditions that leave no room for doubt e you a clear picture of the comparative ability of files to nove stock.

n these hand tests, rigidly made and impartially conducted, holson, Black Diamond and McCaffrey Files completed 30 units work while other brands finished only 20.

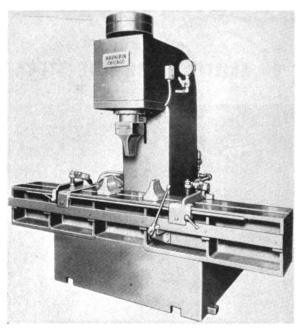
This means a machinist in your plant can increase his production by if he changes to Nicholson, Black Diamond or McCaffrey Files. His time costs you less money because he produces more. And cause labor is the big expense item in filing costs, you make subnitial savings by specifying one of these fast cutting brands.

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Your Mill Supply dealer carries a full line of Nicholson, Black Diamond or McCaffrey Files. Nicholson File Co., Providence, R. I., U. S. A.







Hannifin 35-Ton Straightening Press

movement of the crankshafts which are to be straightened.

The frame, base, reservoir, and the box-type table of the press are entirely of welded construction, thus providing a simplified and strong assembly without unnecessary weight.

Specifications for the press include: capacity, 35 tons; stroke, 6 in.; ram

Specifications for the press include: capacity, 35 tons; stroke, 6 in.; ram speeds, down 53 in. per minute, up 77 in, per minute; table to ram (up), 20 in.; floor to table, 28 in.; center of ram to face of frame, 9 in.; length of table,

90 in.; overall height a in.; base dimensions 55½x61 in.; and mour 10 h.p.

Bardons & Oliver No. 2 Geared Electric Turret Lathe

To meet the ever increasing demand for high speed turret bill of small capacity that simple in design yet bodies all the modern features of the high production machines x larger size. Bardons Clevelani Inc., Oliver, O., have added to the present line the No. I Geared Electric Turk Lathe illustrated berewith.

Efficiency of design has been emphasized to increase the working opacity of the spindle is well as the tool carring units to a maximum and special attention has been given to the visual appearance. Every consideration has been given to convenience of locations.

tion and the ease of operation of all levers and controls.

The design of the head centers about a standard frame, high torque, quick reversing motor, flange-mounted to drift the gear train of hardened alloy stel gears sliding on alloy steel splined shark mounted on anti-friction bearings. Reversing is accomplished electrically. All clutches have been eliminated.

The flange type of motor mounting Esures positive and almost instantaneous



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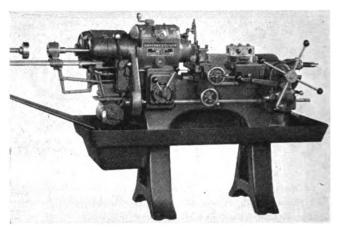
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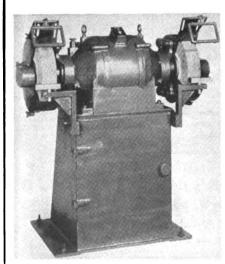
Bardons & Oliver No. 2 Geared Electric Turret Lathe

reversal of the spindle. All gears and shafts are balanced in design to give vibrationless performance at the highest The spindle is mounted on a straight roller bearing in front and on a radial ball bearing and a thrust ball bearing in the rear. The spindle has an American stan 6-in. spindle 1 and can be ped with st hand or sirated chucks. spindle speeds 🕿 obtainable with a single speed 🖘 tor, twelve spin speeds with a to speed moter. addition speed ran available ploying sets of gears ta head. Loss of the in shifting gears eliminated by use of a single lever convenient located on top a the head.

The electric m versing is effected

by a hand lerr conveniently located in front, direcক below the head. For the twelve-specified with the two-speed motor, instable taneous spindle speed changes of 2 to ! are made with a second lever. A unique feature in connection with the electrical equipment is that the magnetic rever-

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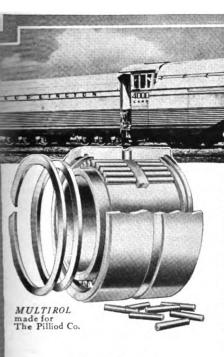
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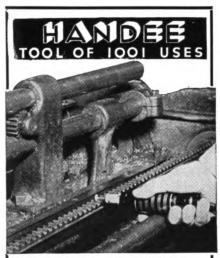
The great load capacity of McGILL MULTIROL Bearings in limited space enables them to far outrun plain bronze or babbitt bearings and ordinary friction types, especially under sustained heavy or intermittent shock loads. Their compactness makes them frequently interchangeable dimensionally with existing bearings, too.

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Name						

ing switch is mounted inside of the machine directly in back of the hand reversing switch.

Relative to the saddle, the turret shothas an effective motion of 7 inches. The hexagon turret revolves on a large preloaded taper roller bearing which the thrust. When in one of the stocked positions, an adjustable claring of superior design holds the turning of superior design holds the turning place. The saddle apron provides sipower feeds to the turret slide from 0.0035 to 0.003 in. per revolution.

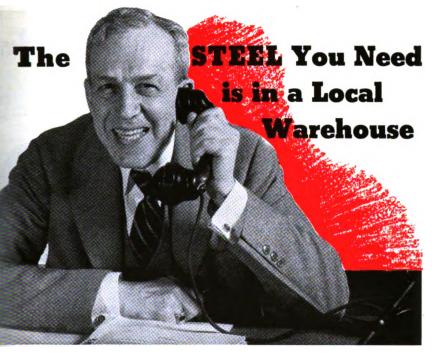
Feeds are changed by the simple mitten of a single lever and read on a casily visible dial. A hand operate pump located on the side of the madinary apron lubricates all important basing surfaces, not reached by the splant spetem, including the side and saddle spetem.

Both the bearing surface on the tom of the turret slide and its burface on the saddle are fitted hardened and ground alloy steel strips. For light work this machine be furnished without power feed turret slide.

Three different cross slide and captured was a facing and cutting off steel cast iron, the cross slide is equipped a hand screw feed. For high speed a lever feed cross slide is used. A combination unit offering both types of feed gives the operator the chance to select the type that is more suited to the particular job.

Two hand-operated bar feeding mechanisms are available—the ratchet type and the finger type. With the ratchet type the bar is supported in a 2-jav chuck mounted on anti-friction bearings The supporting head slides concentrically with the spindle on two horizonts. parallel bars. A simple motion of the hand lever actuates both the autom chuck and the bar feed. For small of stock at high speeds the finger feed is more suitable. A feed i grips the bar directly behind the effects the bar forward and returns to original position after the collet is centred in this way, the stock may be used to a length of a few inches. False Pales 3 may be interchanged in the feed fa to handle stock of all sizes and shee

For semi-automatic operation of the machine, the electric power-operated setomatic chuck and bar feed is available. This extremely compact unit is mount in place of the regular type of automatic chuck and bar feed. When the tripping mechanism is engaged an electric material driven compound cam drum makes of revolution and automatically stops. The



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cam in turn is connected to the automatic chuck and bar feed sliding head. The stock is gripped and fed forward by either an inside or outside feed finger, similar to the hand finger bar feed. The power cycle is started by the motion of the cross slide and is set to trip immediately after the cutting-off tool clears the work. The work is fed forward a predetermined length and the collet closed before the time that the first tool is in the cutting position, eliminating all stock feeding time. For pieces requiring complicated tooling the power cycle may be actuated by a slight pressure on a small hand lever located in front of the head end bracket.

The coolant pump is driven by means of a V-belt and sheave on the motor

shaft.

Zeh & Hahnemann Straight Side Press

Zeh & Hahnemann Co., 184 Vanderpool St., Newark, N. J., has placed on the market a straight side press of 75-ton capacity. The press is of built-up tie rod construction and has a single crank. The press is equipped with balancing cylinders for the slide, force feed lubrication, Norma-Hoffmann roll-

BURKE Milling Machines



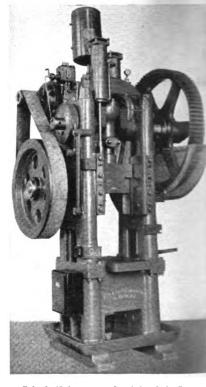
Burke motor driven milling machines, Nos. 1, 2, 3 and 4 are specially suited for handling small, difficult work on a production basis.

Write for complete information.

BURKE MACHINE TOOL CO.
297 E. 16th St. Connegut, Ohio

er bearings, individual motor dive, oil pan and pump.

The press operates at 50 strates a minute, the maximum stroke being in. The bed area, front to back, rie



Zeh & Hahnemann Straight Side Press

to left, is 20x19 in. Overall floor space required, 59x53 in. The weight of the press, geared, with motorization, is 11.000 pounds.

1000-Ton "Bliss" Hydro-Dynamic Press

A 1000-ton press which applies in proved patentable hydraulic principle to up-to-date metal working requirements has been placed on the markst the Hydro-Dynamic Press Division of the E. W. Bliss Company, 1420 Hasting St., Toledo, Ohio. The design of the



HEN December arrives most of us are inclined to look forward to the holiday period just ahead, but isn't it just as appropriate to look back at that time to see what the year has brought and in so doing place ourselves in a better position to appreciate what is to come. With the wheels of industry turning over at a good clip we like to look back at some good production record or job well done, but let's not overlook the skeleton in the closet — that job on which an outright blunder was made, the delivery (or deliveries) that were not kept, or perhaps just a case of not correctly interpreting a none too clear specification. Name them what you will, and though we are not prone to tell about them in public we all have them, and let us be thankful that we do because it proves that we are still just a bunch of normal human beings trying to get along. We are not all Charlie Gehringers or Joe Medwicks, but on the whole the old batting average is up there and the best of them strike out once in a while, so let's be willing to concede that one out doesn't retire the side, nor one error end the career of a fielder — it's the totals at the end of the year that count.

Thanks for listen'en.

GODDARD & GODDARD CO.

Detroit • Michigan





In grinding, polish . . . in removing and many similar Haskins Flexible Shaft Equipment has proved its superiority. Most of the large car manufacturers and thousands of machine shops and industrial plants the world over are saving time and cutting costs with Haskins finishing and grinding equipment. Probably you can too. R. G. Haskins Company, 4667 West Fulton Street, Chicago.

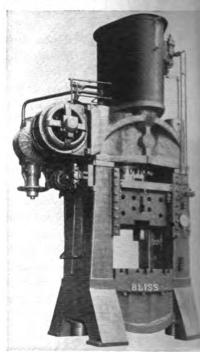
Send For Illustrated Booklet

Showing different Haskins models, illustrating scores of uses for which this equipment has been adapted. It will give you many ideas for cutting costs and speeding up production.

European Rep.—G. E. Marbaix, Ltd. Humglas House, London, S. W. 1



press emphasizes frame constructed adjustability of stroke and finger control. Side frames are keyed to crown and bed so that the house rather than the tie rods, take any to sional strain which is inevitably presin a representative collection of dies deep slide is guided by long adjusted gibs of standard approved design.



1000-Ton "Bliss" Hydro-Dynamic Pr=

Full electric finger-tip control is provided, both for production operation and for inching. Three speeds forward as high speed return are features of the efficient, yet simple control. The threspeeds forward, in this particular caracter a high speed positive advance at 1100 in. per minute; an intermedial pressing speed of 60 in. per minute appressing speed of 60 in. per minute as a slower pressing speed of 20 in. In minute on pressure capacities over tons. Change from one speed to other is automatically controlled as pressure increases. The change founds approach to intermediate may be governed by the position of



slide so that the slide will slow to the intermediate rate of speed just before contacting the work.

A choice of operations under or over 250 tons can be made by simply turning a selector switch. When the press is operating at pressures below 250 tons, the slow pressing speed is eliminated, as the 1000-ton pressing area is not used. With this choice of operations, pressure is adjustable from below 50 tons to 1000 tons.

Push buttons are provided for emergency stopping in any position of the stroke so that the press cycle can be stopped after it is once started. Once stopped, the press may be restarted in either direction. Inching may be accomplished by the use of electric push buttons after the selector switch is turned from the "Rum" to the "Jog" position. Inching by push button control makes available the same protection against over-pressure and over-travel as when the press is being operated continuously in production.

A hydraulic cushion of 100-ton capacity is located in the bed of the press for blank-holding or shape-holding purposes. The pressure of the cushion is always indicated, whether or not the cushion is moving. Return of the cush-

ion during the return stroke delayed to allow the main allow the work.

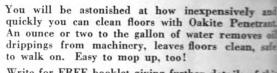
A Bliss special normally-open prefill valve is used to fill the main inder from the tank during the posting quick closing of the press, insuring free flow and protecting the pagainst cavitation when pressure is a plied, and also providing for a regeneration of pressure. An air filter, filter, and efficient oil cooler are in nished with the press. The oil cooler equipped with thermostatically entrolled water inlet valve.

The press is designed to operate approximately 16 cycles per minute the operating continuously with full as matic control. The shut-height or space is 20 in. and the maximum least of stroke is 15 in. The bed area in. (front to back) by 43 in. (right, left), and the area of the slide for 37x37 in. The 27-in. diameter cusp pad in the bed has a 7½-in. stroke a pressure capacity of 100 tons.

Niagara Series SL Power Squaring Shears

The line of machines and took sheet metal work made by the Machine & Tool Works, 637 North

KEEP FLOORS CLEAN



Write for FREE booklet giving further details of this and other money-saving Oakite materials for production cleaning, burnishing, grinding, rust proofing.

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Branch Offices and Representatives Located in All Principal Cities of the U. S.

with OAKITE PENETRANT

he FAFNIR"Shop Hint" PAGE

s Montb's Prize Winner ADGET" SAVES TIME TTING UP LATHE, LANER, SHAPER JOBS

Mr. Vierengel uses a No. 304 Fafnir Ball Bearing, mounted on the end of a piece of key steel. When he wants to true up a lathe job, he puts the "gadget" into his tool post and, with the chuck not too tight, and, with the chuck not too tight, lets the bearing's outer ring bear lets the bearing's outer ring bear slowly. He uses the same principle on planer or shaper, bending the steel arm to get side thrust the steel arm to get side thrust on the shaper jobs. Try it outled

SUNNY SOUTH Rings The Bell FOR \$5 PRIZE!

A standout from this month's "Shop Hints" is the clever wrinkle suggested by Mr. S. Vierengel, West Palm Beach, Florida. (How's the weather down there?) Mr. Vierengel walks away with an easy \$5.00 for this one.

WHERE'S YOUR SHOP HINT?

Come on, boys, don't be bashful! Grab a post card right now and write down one or more of those little kinks you use in the shop to make the work go easier or faster. Your ideas are as good as the next fellow's! Do it now! And mail to The Fafnir Bearing Co., care "Shop Hints". New Britain, Conn.

Dwn Prize Winning Hint

usive self-locking collar on Fafnir Wide ng Ball Bearing Units just can't be or simplicity of installation . . . just

be sbaft through the bearing unit. Le the collar with a turn.

e screw—inner ring is locked to shaft.

the Fafnir Unit is ready to run withightest possibility of loosening, and it's sy to disassemble... you get this fearry one of the wide line of Fafnir Transnits, in a size and type to meet every it. Write for the Engineering Catalog. Bearing Company, New Britain, Conn.



AFNIR BALL BEARINGS.

ALANCED LINE - MOST COMPLETE IN AMERICA

Ave., Buffalo, N. Y., has been augmented by the addition of the Series SL Power Squaring Shears. These shears are built in 6, 8, 10 and 12-ft. lengths for the flat shearing of 3/16-in. steel, and in 14 and 16-ft. lengths for No. 10 gauge steel.

Features of the shears include a triangular section crosshead with low slope, enclosed drive mounted on anti-friction bearings running in oil. 14-point engagement sleeve clutch with builtin single stroke mechan-

ism, and Niagara alloy steel knives.



Niagara Series SL Power Squaring Shear

Special "Toledo" Automatic Feed Press

The Toledo Machine and Tool Co., division of E. W. Bliss Co., 1420 Hastings St., Toledo, Ohio, announces a new and improved open back press on fixed legs, to be known as the No. 79½ "Toledo." The frame of the machine is a one-piece,

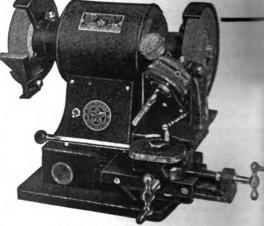
high-test semi-steel casting, and a h.p. 1200 r.p.m. motor is required operation. Both the drive shaft and flywheel are mounted on Timken friction roller bearings, while the fail and connection bearings are bookened.

Outstanding features of the press an electric push button control who makes it necessary for the operator keep both hands on palm buttons up completion of the working portion

Grinds 81 SIZES OF Drills

No. 31 to 1/2"

This Star Precision Grinder puts drill grinding on a production basis. Its simplicity and accuracy saves as high as 50% on drill costs and insures uniform accuracy that guarantees perfect holes and increases production.



Write for descriptive folder.

STAR MACHINE & ENGINEERING CORP.

Division of Star Electric Motor Co.

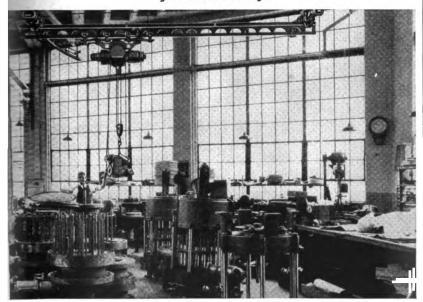
BLOOMFIELD AVE.

BLOOMFIELD, NEW JERSEY

OVERHEAD MATERIALS HANDLING

<u>CLEVELAND TRAMRAIL</u> CRANES OR TRANSFER BRIDGES

give full coverage



 They are arranged for complete hand or motorized operation of bridge-carrier and hoist; or for combination

hand and motor operated.

Consult your phone directory under Cleveland Tramrail.



The **BOWGAGE**

INDEPENDENT
GRINDING WHEEL
HEAD



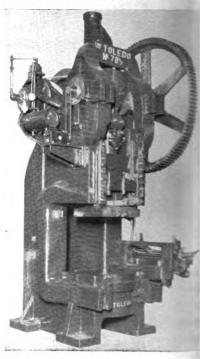
A self-contained unit hydraulically operated with an automatic grinding cycle—with DIMINISHING FEED. Can be applied to most any plain grinder.

Weight 1900 lbs. Takes wheels 24"x2"x12" — 20"x 4"x12".

FITCHBURG GRINDING MACHINE CORP.

Fitchburg, Mass.

the stroke, an anti-repeat mechanian air brake for stopping the flyance an air counterbalanced slide, acrossbar knockout. Dimensions of press are: 12-in. stroke; 3-in. alment of stroke; distance from busilide, 20 in., stroke down, adjusting; bed area, 28x41 in. front to by right to left; distance between a



"Toledo" No. 791/2 Automatic Feed Press

 $21\frac{1}{2}$ in.; area of capped and respectively.

The press has a single roll feed with a seven-roll power driven straighten to provide an automatic method of feding the stock from 0 to 12 in. The fed is mounted on the bolster and the levil at which the rolls operate can be adjusted up or down to suit the height of the dies. In conjunction with the purble to n control, electrical protects switches can be incorporated in the dies or on the feeds and hooked up in serie with the stop button to hait the preshould a jam or other mishap occur the feed.

The flywheel-type multiple disk



get maximum accuracy from BATH s-from BATH Thread Gages too. Why guarantee accurate results by using them ther? In this way you check accurate ing with an accurate gage-you can't

TH Taps and Thread Gages are ground a the solid after hardening. Thus, the h edges have the same perfect grain cture as the heart of the tool. They're h all the way through.

JY BOTH FROM BATH OHN BATH & RCESTER MASS.



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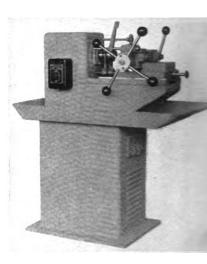
tion clutch is of the new fast-cutting pneumatic type, the direct action feature of which is one of its more obvious advantages.

Geometric No. 14 Threading Machine

The Geometric Tool Company, New Haven, Conn., has placed on the market a threading machine of quite different design. Known as the No. 14 Threading Machine, this equipment is intended for the precision threading of duplicate parts.

Light in weight, this machine will cut standard pitches up to 9/16 in. and fine pitches in larger sizes. Either a Geometric Style KD Die Head with conventional Milled or Tapped Chasers, or the Style TR Geometric Die Head with Tangent or Circular Chasers may be employed.

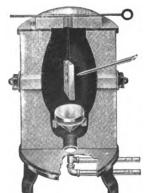
Among the unique features of this machine is the wide range of holding devices that can be used. The Geometric Tool Company furnishes either a standard two-jawed vise or a s'andard collet chuck. For simple jobs, the user can purchase the machine without work holder, mounting his own design of holder on the machine platen.



Geometric No. 14 Threading Machine

Both the standard vise and standard collet chuck are equipped wan adjustable alignment feature that

NO SCALE—NO OXIDATION—NO PITTING For Better Heat Treating—NEW INTEROVAL



Heat straight carbon steel, Hi-Carbon, Hi-Chrome and High-Speed steels without loss in size, or danger of Pitting or oxidation. Pyrometer fire end close to work. 2400° at less time with lower fuel cost. Openings on both sides of furness permit heat treating long parts or tools. A solid cast nickel tray is furnished which fits through

these openings allowing continuous feeding and heat treating of small parts. Convertible into lead, cyanide or salt bath furnace accommodating 6"x12" pot.

BENNETT INSURED STEEL TREATING CO.
130 SOUTH ST. NEWARK, N. J.



Write for Your Copy



EN, in an advertisement of veral years ago, we showed il photograph of a tangled oebling Cold Rolled High teel Flat Wire, it excited orable attention and complimitation of the cold of th

it again as one example of

the many flat wires we make to meet' exacting requirements.

It gets the severest kind of punishment in actual service. It is yanked around, coiled, tangled, bent. But it has to survive.

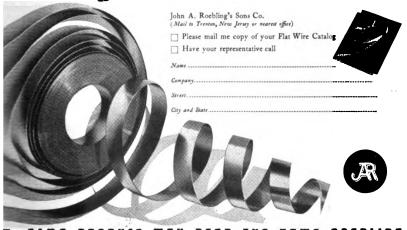
Naturally it is a very tough and resilient flat wire. Tensile strength—high. Temper—uniform and held within very close limits. Also—accurate di-

mensionally and notably free of defects on the surface and edges.

We would welcome your inquiry about Roebling Flat Wire, high or low carbons. We specialize in flat wire to meet exacting specifications and have special custom production facilities to handle this type of work.

JOHN A. ROEBLING'S SONS COMPANY
TRENTON, N. J. Branches in Principal Cities

${\it pebling}$ cold rolled steel flat wire



FINE PRODUCT MAY BEAR THE NAME ROEBLIBS

unique. Pivoted on large bolts, both vertical and horizontal adjustment of the work holder may be readly made without the use of gibs or shims.

The illustration shows the machine

The illustration shows the machine equipped with the sandard two jaw vise. Direc ly in nack of .e turns le is shown the automatic work gage which gages the proper seting of the work, then swings out of the way as the work is tightened in the vise.

The work spindle and drive shaft, made of special alloy steel, hardened and ground, are mounted on Timken Roller Bearings. Pick-off change gears permit a wide range of threading speeds desirable when threading different diameters and many different materials.

Driven by a Double Vee Belt Driven from a motor mounted in the base, this machine is very compact with all controls and working parts readily accessible. An automatic reversible type pump supplies an ample amount of coolant.

Baker Tool Room Furnace

A tool room furnace which operates on gas and has a temperature range up to 2000 deg. F. without either blower or compressed air is now being made by

GRAY TURRET HEAD

Metal Cutter



or Nibbler

Cuts all metals any shape
—30 gauge up to 1".

Gray Machine Co.
Dept. A, P. O. Box 586
Phila. Pa.

Baker & Company., Inc., 56 Austin S Newark, N. J. The furnace is design to burn with one gas inlet on the rest



Baker Tool Room Furnace

lar city gas line, no air connection ing necessary. No heat escapes into shop and with the automatic door cio it is said that the hand can be pla on the outside casing. All walls newly developed refractory insulatover 3 in. thick. The floor, which of cast chrome nickel, is said to be it less" and designed for long life. It temperature is controlled by a st cock on the heat manifold.

The furnace is built in three at No. 1, which is 6x8x6 in.; No. 2, 6x: in., and No. 3, 8x8x6 in. All are 6 high. The No. 1 size will reach a uperature of 1400 deg. F., starting in 15 minutes and will maintain temperature constant at about one can hour (Newark, N. J. rate). We designed primarily for heat treating a non-oxidizing heating chamber, furnace is also used for other work.

ADJUSTABLE ANGLE TILTING TABLE

Suitable for adjustable angle machining by means of our 71/2" Rotary Table, Vises or other holding fixtures.

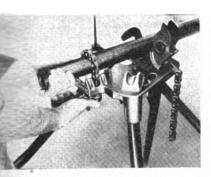
Write for detailed description and price.

JOHN B. STEVENS INC.

306 HUDSON ST.

NEW YORK CITY





"Vulcan" Vise Stand No. V-1

"Vulcan" Vise Stand No. V-1

J. H. Williams & Co., 75 Spring St., w York, N.Y., announces in their Vuln Vise Stand No. V-1, a portable and ficient unit combining a complete and, chain pipe vise and pipe bender he base, which is made of high-grade alleable iron, is of sturdy and well-reforced construction. The legs are of in pipe with upset feet punched for stening to the floor, if desired. The gs fold for carrying and are held to-

gether by a simple tie chain. The vise jaw is of tool steel, carefully hardened and tempered.

and tempered.

The Vulcan Vise Stand V-1, finished in orange enamel with black legs, weighs 35 lbs. and will take pipe from ½ to 2 in. The pipe bender will handle pipe up to ¾ inch.

Stark Integral Drive Precision Bench Lathe

A precision bench lathe with built-in motor and speed changing mechanism, comprising an entirely self-contained unit, has been brought out by Stark Tool Company, Waltham, Mass. The unit, illustrated herewith, can be put into service immediately upon making the electrical connection, no bench cutting or fastening being necessary.

ting or fastening being necessary. The feature of the machine is the Stark Integral Drive which is a patented device consisting of a ball bearing ½ h.p. motor driving through a disk clutch and variable V-belt sheaves and through V-belts to the head-stock. This drive will provide any speed between 156 and 2200 r.p.m. in the Standard Model, or between 300 and 3000 r.p.m. in the High Speed Model. Speeds are instantly changed by means of a conveniently lo-

PULLMORE CLUTCHES

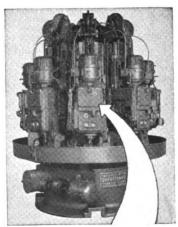
Vork Well and Save Space n Sundstrand Vertical Lathe

No. 3, single type, Pullmore Clutch, running in oil, in each the 8 Hydraulic Units of the Sundstrand Vertical Lethe shown right, is automatically engaged for spindle rotation during rapid proach and feed of its Unit, is disengaged so that spindle mains stationary during quick return. This service demands a li measure of reliability and durability in the clutch—and these emands are satisfied by the Pullmore. The design of the Hydraulic nits calls for a clutch that is compact and easily installed—requirements that are satisfied completely by the Pullmore.

complete information about Pullmore Clutches, illustrations of teary of their applications, and other useful information will be bund in the Pullmore Blue Book. Write for free copy, today.

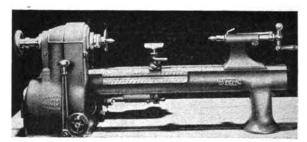


Porg-Warner Corporation, 300 Catherine Street, Rockford, Illinois and by MORSE CHAIN CO., Itheca, N. Y. Offices in principal cities









Stark Integral Drive Precision Bench Lathe

cated hand wheel, and are registered on an indicator mounted on the switch column. Machine operation is con-trolled through a small control lever, the clutch being released while the con-trol lever is in the vertical or neutral position, engaged when the control lever is moved to the right, and the brake engaged when the control lever is moved to the left.

The machine can be supplied in four models, all of which have 9-in, swing and 40-in, bed. The Standard Model No. 4 has %-in. collet capacity, the Standard Model No. 4½ has 1-in. collet capacity, the High Speed Model No. 4 has %-in. collet capaig and the High Speed Model No. 4% has 1-2 collet capacity.

The Standard Mode ! equipped with a hard ened spindle, with the pered bronze bearings a both ends. These bear adjustable s ings are one point for wear so maintain alignment efinitely. The Hig indefinitely. Speed Model is regular fitted with anti-friction bearings, pre-loaded fr maximum life and pre

cision.

Any one of these four models witake all of the Stark precision attachments except the milling attachment. The machines are finished in gray proxylin lacquer with chromium roxylin lacquer with chromium and handles. The machine weight regular equipment, 310 pounds.

Fellows Hourglass Thread Generator

A new type of Hourglass Threef erator for cutting hourglass worms has recently been placed

IT'S PRECISION BUILT .the G-O 21" Sliding Head Drill

Here's a typically accurate, flexible, yet larger C-O Drilling Unit for high production drilling of large holes. Self-feed and back gear attachments provide a wide range of speeds and feeds.

Vertical Motor Drive—eliminates unnecessary pulleys, idlers, twist and turn belts, reducing wear and vibration; cone pulleys are dynamically balanced, a flexible coupling inserted removes vibration in the drive shaft. Two Timken Roller Bearings in the Spindle Quill at the top and bottom, provided with a screw adjusting collar for the property of the provided with a screw adjusting collar to the provided with a screw adjusting to the provided with a screw adjusting to the provided with the provided with the provided with a screw adjusting to the provided with a screw adjusting to the provided with a screw adjusting collar to the provided with a screw adjusting to the provided with for take up. Annular ball bearing in the motor cone pulley, and ball bearing motors. Positive type power feed is controlled by a push knob.

Canedy-Otto Drills, are always "Ready For The Jeb".

Write for illustrated circular giving complete details.

CANEDY-OTTO MFG. CO.

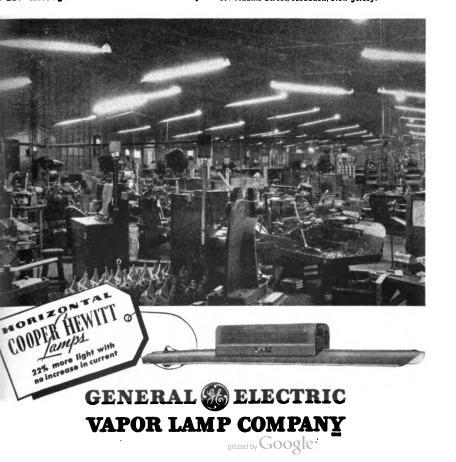
CHICAGO HEIGHTS

ILLINOIS



JT INDUSTRY'S MOST PRODUCTIVE LAMP to work for you!

The accuracy and speed must be combined light series a most important production "tool". The time cally lost in the mere physical act of "seeing" due rapproper light, and the eye fatigue which slows up function and multiplies errors must be banished. per Hewitt light does this most effectively and has ver-increasing numbers proved a boon to workers employers alike. > > Now Cooper Hewitt lamps 22% more light with no increase in current. They hang horizontally to provide the most efficient light distribution. Troublesome shadows are eliminated. Workmen can see detail anywhere and work without eye fatigue throughout the entire shift. > > > Put industry's most productive lamp to work for you. You'll find it a production "tool" that promotes profits from every man and every machine when engineered to fit the job. > > > General Electric Vapor Lamp Company. 897 Adams Street, Hoboken, New Jersey.



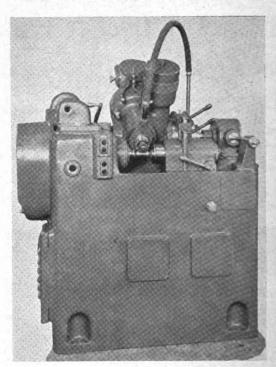


Fig. 1—Front view of Fellows Si 6T-Type Hourglass Thread Generator for the accurate and rapid mating of hourglass steering were

production of accurate as smoothly finished worm three at an extremely rapid rate.

The work is customarily b between cones, one on the s driving arbor in the headste and the other on the tails center. The cutter is kept step with the threads on work through feed gears is fed down directly into work, the rate of feed per I lution being governed by rise on the feed cam, in junction with feed gears. depth feed cam is prot with a depression which a the cutter head to be I matically elevated when worm is finished, thus per ting removal and inserting the work.

The depth feed cam is mean that the majority of stock is removed with a faccoarse feed, then the feel reduced for the remained depth of cut, and finally cutter is allowed to dwell several revolutions,

any down feed, to produce a small finish on the work. The machin operated by a starting lever control to the electrical push button on and the feed cam.

The outstanding features are:

market by the Fellows Gear Shaper Company, Springfield, Vermont. This machine, a front view of which appears in Fig. 1, is of massive construction and employs a cutter head of the "swinging" type, which is operated by a cam, as shown in Fig. 2.

It is intended for highproduction work and is
arranged with automatic
electrical control which
greatly facilitates operation.
It is also designed for quick
removal and insertion of
the work, and in addition
has other features that will
be appreciated by the production executive. The rigid
design of this machine and
the method employed in
presenting the cutter to the
work, makes possible the

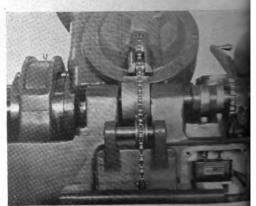


Fig. 2-Close rear view showing Depth Feed Cam, Starting Lever, Automatic Switch and so on.







... that's what buyers say when they examine the new Parker-Kalon Coldlorged Socket Screws. These new Screws have set a higher standard of quality hat wins the unqualified approval of engineers and production men.

There are good reasons for the excellence of these new Screws. They are the result of more than two years of intensive research and development work . . . and the unequalled Parker-Kalon Laboratory facilities for securing and controlling the strength, precision and other essential qualities of socket screws.

Send for free samples of the type you use, and descriptive folder. The product will speak for itself.

ARKER-KALON CORP., 200 VARICK STREET, NEW YORK

PARKER-KALON SOCKET SCREWS

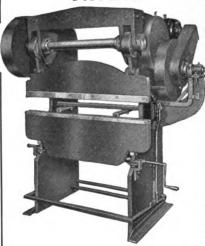
BETTER Engineered STRENGTH Controlled UNIFORMITY Micrometer ACCURACY

DESIGN

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CHICAGO STEEL PRESS

No. 253



Does 40% to 60% of the forming work turned out by the average shop.

Here's a profitable, economical brake ideally adapted for rapidly forming metal sections such as in stoves, refrigerators, soda fountains, steel cabinets, metal furniture, steel boxes, and a great variety of sheet metal specialties. Its variable speed drive operates from 17 to 50 strokes per minute. The No. 253 CHICAGO STEEL PRESS is accurate, compact, and ruggedly constructed of highest quality materials.

Sizes 4, 5 and 6 ft. capacities, up to 10 gauge.

Write for Circular No. 253

DREIS & KRUMP MFG. COMPANY

7418 LOOMIS BLVD.

CHICAGO

ILLINOIS

production, ease and rapidity of opertion, and smoothly finished worms.

Edlund Production Drilling Machine

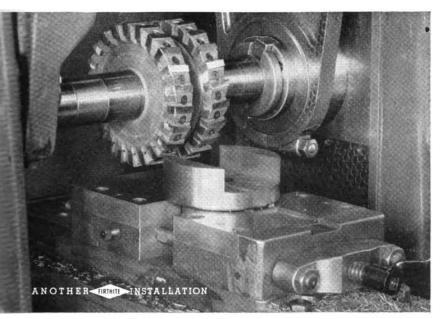
The Edlund Machinery Company lac Cortland, N. Y., has recently placed a the market a line of drilling smaller with the motor on the spindle. The



Edlund Production Drilling Machine

machines are built with 8", 12" or is overhang from one to eight spindles as may be equipped with ball bearing begar, semi-automatic power feed, recring motor and controls for tapping pump, tank and piping for coolant as other features.

If the machine is to be used for all ing only, speeds may be 600-900-1900 and \$1 RPM or 600-1200-1800 and \$1 RPM or the machines may be supply with reversing motors with speeds 6



FIRTHITE

ANOTHER PROFIT MAKING INSTALLATION

Cutting semi-hard cast iron couplings on a Milwaukee Simplex. FIRTHITE tipped cutters take one cut where formerly two were necessary.

Speed of 225 Feet per min.

Depth of cut 1/8 inch.

Table feed 17 inches per min.

Production almost doubled.

Finish improved.

Tool life increased.

FIRTHITE cutters can be operated at cutting speeds high enough and chip loads per tooth low enough to finish tragile parts in one cut, maintaining both accuracy and finish.

Consult us for specific information on possible FIRTHITE installations in your shop.

FIRTH + STERLING

Works McKEESPORT, PA.
NEW YORK CHICAGO
HARTFORD PHILADELPHIA
LOS ANGELES DETROIT
CTEVELAND DAYT IN

600-900-1200 and 1800 RPM.

Speeds are selected by turning a knob at the front of the machine and are indicated on a dial. On multiple spindle machines each motor may be stopped with the drum control or the entire machine may be stopped by means of a foot control. Overload and no-voltage protection are provided for each motor.

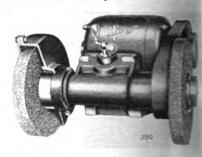
The machine shown has 12" overhang and is equipped with semi-automatic power feed. The feed engages when the drill touches the work, and the depth may be set by means of a dial, or the feed may be disengaged by raising the feed lever. The spindle may also be advanced ahead of the feed if desired.

Special attention has been given to the rigidity of the machine to eliminate vibration and distortion under load. The machines are so designed that power feed, back gears, or both may be added at any time with a minimum amount of work.

Hisey Two-Wheel Wide Range Precision Grinder

A grinding machine with two wheels and designed for a wide range of work has been developed by The Hisey-Wolf Machine Co., 2745 Colerain Ave., Cin-

cinnati, Ohio. The machine is especially adapted for grinding rolls and similar work where end space is limited, and

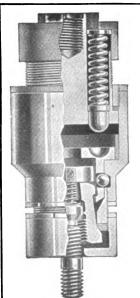


Hisey Two-Wheel Wide Range Precision Grinder

the larger sizes can be used to admitage for grinding car wheels. The see wheel can be transferred from one of the spindle to the other or two when can be used when work permits.

The machine is made in six sizes from

1 to 10 h.p. and for wheels from 20-in. diameter. The machine i ered by a constant speed dyna balanced motor, either A.C. or D



TITAN STUD SET CONTROLLED DRIVE Ass Perfect Setting

The Titan Stud Setter has a safety clutch which trols driving power.

The Titan is positive in driving and automs releasing, thus making it possible to set the any predetermined degree of tightness.

When the studs are driven to the specified ti the drive is automatically released and the to be removed without fear of mutilating or dethe threads.

The great capacity, speed range, utility, and of this production tool make the Titan Stud a profit-earning tool wherever it is used.

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TITAN TOOL COMPA PENNA

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FAIRVIEW



THE CARBORUNDUM COMPANY . NIAGARA FALLS, N.Y.

dovetail slide with screw feed and handle affords rapid adjustment to the work. This adjustment, due to the angle of the slide, does not affect the belt tension. Direction of rotation of the grinding wheels is reversible through the motor. The grinding spindle is mounted on matched precision ball bearings which are ideally suited for the requirements of precision grinding.

The lubrication system envelopes all the bearings in a mist of oil and all oil is filtered automatically. Bearings are protected with combination labyrinth and contact seals. The machine can be supplied for any spindle speed required; however, the speeds recommended by the Grinding Wheel Manufacturers are recommended.

Stow Assembly P Three-Speed Bench Type Flexible Shaft Machine

The Assembly P Three-Speed Bench Type Flexible Shaft Machine illustrated—product of Stow Manufacturing Co., Inc., Binghamton, N. Y.—is designed for bench mounting and may be used equally well mounted on a truck or on a wall in back of the bench. The ma-



Stow Assembly P Three-Speed Bench Typ-Flexible Shaft Machine

chine is equipped with a Stow ball bearing countershaft which is hinged and provided with a screw for belt adjustment. The unit is designed for switching in both horizontal and vertical planes, giving the flexible shaft the maximum of freedom and making it possible to use the shaft in any position without injury.

Motors can be supplied to meet and



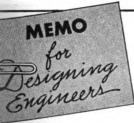
Lufkin Telescoping Gages come in six sizes with a range from 5/16inch to 6 inches, and also packed in complete sets in attractive red leatherette cases. There's one thing about a Lufkin you'll find in no other telescoping gage—the handle can always be locked in the center of the plungers. This outstanding feature gives that perfect balance and feel so essential to accuracy. But that's not all. Lufkin Telescoping Gages are precision-built—you can depend on them not only for accuracy, but for continued service as well.

See your nearest dealer or write for illustrated Catalog No. 12.

NEW YORK

THE LUFKIN RULE CO.
SAGINAW, MICHIGAN

WINDSOR, ONT



Gearing possibilities greatly enlarge the scope of Flexible Shafts....

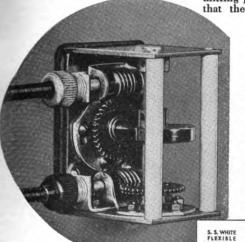
When considering flexible shafts for transmitting power, it should be borne in mind that the normal torque capacity of any

that the normal torque capacity of any particular size of shaft can be increased to any reasonable amount by the use of simple gearing.

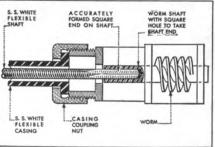
And where accurate synchronism between driving and driven members is essential it can also be secured in the same way.

In the case of a remote control, any desired degree of sensitivity can be provided by using gearing at one or both ends of the shaft.

The typical geared assembly shown in the illustration, makes clear how readily flexible shafts can be applied to gearing.



Drawing at right shows how flexible shafts and their casings are attached in this application. This is but one of the innumerable combinations of shafts and gearing that are possible.



If you have a power drive or remote control problem, our engineers will be glad to submit recommendations. No obligation. Just send us essential data.

The S. S. WHITE Dental Mfg. Co. INDUSTRIAL DIVISION

10 EAST 40th ST., ROOM 2310S, NEW YORK, N. Y.

electrical specifications. The machines carried in stock are for 110 to 220 volts. \$0 cycle, one phase up to and including ½ h. p. and three phase for 1 h. p. Standard equipment includes switch, cord, plug and ball bearing hand piece with clamp spindle to take grinding wheels, buffs, scratch brushes, and so on. Angle heads and special hand piece can be furnished interchangeable with the standard hand piece. All Series 37 attachments are interchangeable in the same size range.

Buffalo Automatic Shear for Bolt and Rivet Stock

Buffalo Automatic Shear for Bolt and Rivet Stock

The machine illustrated has been developed by Buffalo, N. Y., for high speed production in the accurate shearing of bar stocks for bolts or rivets. Designed for continuous shearing, the machine is equipped with automatic feed rolls which are driven direct from the intermediate shaft of the shear. The rolls grip and pull the stock into the shear only when the knives are open on the upstroke of the machine, and release their grip the instant the stock touches the rear gage and the top knife starts

to descend. Thus the rolls are prevented from scoring or marring the stock under pressure.

Difficulties that arise from ordinariregularities in bar stock are overcomby the use of a specially designed rewhich automatically adjusts itself. The bars are fed and sheared at one at a shearing rate of 30 strokes per minute, giving a total of over 5000 shear pleces per hour. An openside tilting gage, which is located at the rear of the machine, can easily be adjusted for

length of bolt up to in. for automatic fee and 48 in. for hand fee. A special cropping gains also provided for ming off 1 in. on each ting off 1 in. on each the start of a min order to make sure a square end and to move the ragged "movet." This gage submatically swings out the way after the fire cut.

When the end of the stock bars reach the feer release, an automatic stop disengages to clutch on the shear. The automatic stop, which electrically operated adjustable in a manner that permits the salvaging of the predetermine length of any ends.

length of any ends.

The clutch may be engaged either by means of a hand lever or by fow pedal, both being provided. The clutch disengages automatically after each stroke or can be set to run continuously until disengaged by the

automatic stop.

The drive is quiet and compact. The motor

mounted on top of the shear frame and power is transmitted by means of V-belt direct to the flywheel. All gears as well as the flywheel belts and motor puller are totally enclosed within expanded metal guards. The machine is built is a variety of sizes and capacities.

U. S. Model 66 Adjustable Speed Grinder

The U. S. Model 66 Grinder illustrates—product of The United States Extrical Tool Co., 2471 W. Sixth St., Chrinnati, Ohio—has been designed by the



ES-UP TO 21-INCH BORE!

agged giants they are, in their oility to carry loads and stand to punishing jobs. Yet they we all the PRECISION, the fineess, the friction-free smoothess, of their pigmy brothers in e NORMA-HOFFMANN line. ***

And, between the biggest and the smallest, a complete range of sizes is available—each marked by the family quality of PRECI-SION.*** There's a PRECISION Bearing (ball, roller or thrust) for every load, speed and duty.

Send for the Catalogue . . . Let our engineers work with you

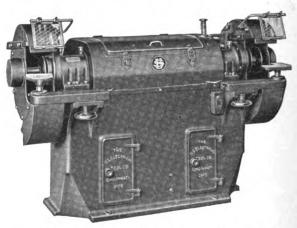


BALL. RVLLER AND THRUST

firm to meet the demand for an efficient belt driven, adjustable speed grinder which shall be free from vibration.

170

The machine is of unusually sturdy design, powered by a motor (built to N.E.M.A. standards) which runs on heavy duty ball bearings. The push button control carries low voltage and overload



U. S. Model 66 Belt-Driven Adjustable Speed Floor Grinder

Ludlum Hard Surfacing Electrod

Ludlum Steel Company, Waterviet. Y., has brought out a hard surfact electrode in three new alloys intended use in applying wear resistant overs or inlays on new or used equipme. The alloy used in these electrodes

said to provide a equalled resistance abrasion and impi Before placing on market, the electron have been tested on wide range of uses fr plow shares to the m ufacture of cement, for equipment used in d ging the Cape Cod Cal to the manufacture automobile tires. Tel nical data sheets h been prepared detail the individual prop ties of the various Li lum electrodes, their p poses, suitable appli tions and effective me ods of hard surfact procedure. These di sheets are available up request.

protection. Three spindle speeds are available, the changes being easily and speedily accomplished. Correct belt tension is maintained at all times. A patented safety device prevents overspeeding of wheels. Safety is assured by the use of patented adjustable type wheel guards made from boiler plate and with permanent exhaust connections.

The grinder is available in 5, 7½ and 10 h.p. sizes for 16, 18, 20 and 24-in. vitrified and high speed grinding wheels.

No. 48 "Abrasaw" Cut-Off Machine for Wet Cutting

The illustration shows the No. "Abrasaw" Cut-Off Machine, which I been brought out by The Bridger Safety Emery Wheel Co., Bridger Conn. This machine is similar in sign to the No. 48 "Abrasaw" Coff Machine for dry cutting, except 28 a coolant tank is now mounted on a side of the machine equipped with set



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Speed, Precision, Power, and Dependability—these are the four distinctive qualities which make the PROVIDENCE DRILL a safe and profitable investment. Whether in large shop or small—whether in the tool room or on the production line—the PROVIDENCE will consistently show that "drill-ability" which is the true measure of economy wherever holes are to be drilled at minimum cost.



Write for the Bulletin

PROVIDENCE ENGINEERING WORKS, INC.

523 So. Main St., Providence, R. I.

able pump and pipes for supplying outing lubricant to both sides of the cutting disc.

The spindle runs in ball bearing in the whole head is suspended on Times bearings, which gives a free, easily out trolled swing of the cut-off disc. The allows the disc to be brought down the material with a light touch in after the cut has been started the



No. 48 "Abrasaw" Cut-off Machine for Wet Cutting

can be finished rapidly. With the prop start of the cut square cuts are of tained and disc wear is brought dos to a minimum.

Two sizes of flanges are furnished pair of 6½-in. and a pair of 4½-iwhen a 12-in. disc is put on the machin the 6½-in. flanges are used and we the disc is worn down to a diamethe disc is worn down to a diamethe the 6½-in. flanges can no loop be used they are removed and are placed with the 4½-in. flanges. By the arrangement maximum support is given



Valuable Blue Prints

Shop Records

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Fig. 1040 "HALLOWEL Steel Bench Drawer, W oilfer proof Cover, for All food and Steel-Wood Top fork Benches and Tables. Benches and

HALLOWELL" STEEL BENCH DRAWERS

These strong, steel Bench Drawers can be easily attached to ANY bench. Handy for safe keeping of small precision tools, valuable blue prints and records-"Hallowells" have master-keyed locks (or padlock, if you prefer). They withstand rough usage, last much longer than clumsy wooden drawers, and never shrink, swell, stick or jam because of the weather.

Our Bulletin gives you details and prices.



STEEL TOTE PANS FOR EASY HANDLING AND STORAGE OF SMALL PARTS OR TOOLS

These welded steel tote pans are very sturdy, intended for heavy work and made to take lots of rough handling. They cannot break-up or become oil soaked like wooden boxes. The handles are cleverly clinched in place and cannot come loose. They're designed so that they can be stacked high without wobbling or toppling. Of course, they're fire-proof. Write for full information.

STANDARD PRESSED STEEL Co.

BRANCHES

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BOX 556

ST. LOUIS SAN FRANCISCO

to the discs at all times.

The hand knobs at front and rear of the machine operate a stop, the rear knob operates the total movement of the head, while the front knob controls the movement of the head to compensate for disc wear.

A quick acting vise that can be op-erated by either foot pedal or hand is furnished. When operating vise with the foot pedal, it allows both hands to be used, one for cutting and the other hand for feeding the work in the vise. When starting a run of cuts, the vise is first set by hand so that it will take a movement of ¼ to ¾ in. of the vise jaw to clamp the work. This is necessary so that there will be enough move-ment of the foot pedal to operate the water valve properly. This water valve is so arranged that the depressing of the foot pedal not only clamps the work but the flow of water is started and continues as long as the vise is clamped. After the cut is made the foot is removed from the foot pedal, shutting off the water supply, also releasing the pressure on the vise so that the vise may be reloaded.

The control of the cutting lubricant can also be operated by hand if this method is preferred.

Ammco 6-In. Crank Shaper

The Ammco 6-In. Crank Shaper S trated, manufactured by Automoti Maintenance Machinery Co., North Cago, Ill., has been designed to meet needs of machine shops where a size is needed that is small in size but so rate and adaptable for a wide range work. The shaper can be mounted or bench or can be had mounted on portable work bench that can be ref from job to job.

The manufacturer states that i machine is adaptable for quick set-has ample speed for rush jobs, is acrate for close work, is ideal for se production and will handle a wide nu of jobs economically and satisfactor leaving the big machines open for the satisfactor.

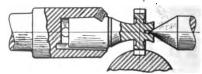
long run jobs.

The standard model is equipped v a three-step cone pulley which prove three speeds to the ram and an au three speeds to the ram and an aumatic cross feed to the table with a variations of feed. The vise is of struconstruction and is graduated at a bottom edge for angular work. The thead is likewise graduated to 90 d. The machine will take a substantia heavy cut. Work may be clamped to the table on the side. heavy cut. Work may be clamped rect to the table, on the sides or on t top, and the table is equipped with

FOR Faster Speeds and Heavier Feed Elimination of Vibration and Slippin



Midwest tested taper and pin drive plus lock screw on taper



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quicker
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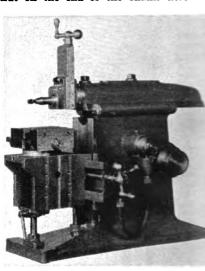
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adjustable support bracket for rigidity. The feed mechanism is easily adjusted it being only necessary to move a small lever to obtain variation in feed. The stroke is adjusted by loosening the lock nut on the end of the shank near the



Ammco 6-In. Crank Shaper

feed eccentric and then adjusting the rocker arm block up or down. All raways and the front of the column at "y" type, carefully fitted and propertigibed for adjustment.

Pyro Micro-Optical Pyrometer

A precision instrument of the higher caliber designed for use in measuring the temperatures of very small object such as incandescent lamp filament and so on, and for laboratory and scientific research work, has been developed by The Pyrometer Instrument Compart 101-105 Lafayette St., New York, N. V. In this instrument, which is known at the Pyro Micro-Optical Pyrometer, twenty-fold magnification of the object is provided by means of an optical arrangement of high candle power. The instrument is used with a rigid supportant tripod, the instrument holder being equipped with a fine precision working arrangement for accurate adjustment in any desired direction so as focus the instrument steadily on an given spot.

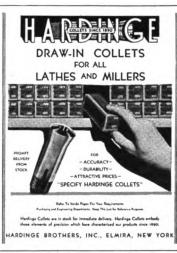
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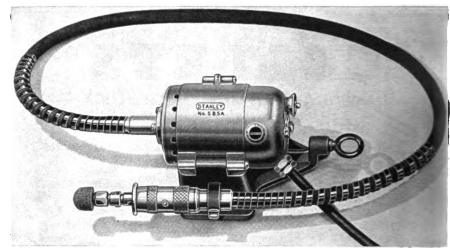
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For grinding tools, dies, moulds, small castings — all types of small grinding . . . this flexible shaft grinder is a necessity in every tool and die room. Full 3/8 H.P. motor runs at 18,000 R.P.M. Finest quality 42" rubber covered flexible shaft; handle piece has ball bearings, and collet type chuck for 1/4" shanks. Accessories, including arbors, pencil wheels and emery wheels, can be supplied. Ask your Stanley distributor for a demonstration, or write for descriptive catalog.

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Complete Equipment Includes:

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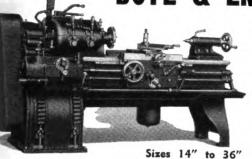
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of Flexible Shaft Core. Rubber reinforced casing protects the shaft against injury and prevents marring the work.

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frequent complete redesigning enables our engineers to incorporate into BOYE & EMMES Lathes every worthy new improvement and many original developand exclusive ments in lathe construc-BOYE & EMMES Lathes are modern in every respect.

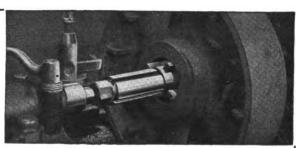
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battery is attached to the instrument. The instrument operates on the principle of disappearing filament and is furnished with the following scale ranges: 600-1600 deg. C., 1600-3000 deg. C., 3000-4000 deg. C., or the equivalent in degrees F.



Pyro Micro-Optical Pyrometer

A powerful objective of 37 mm. aperture produces a reversed image of the object to be measured at about 6 in. distance and it is viewed through the ocular which acts as a microscope. The total magnification of the system is about 20 diameters so that the image of the smallest wire or filament under observation will find the optical field and completely cover the tip of the pyrometer filament image. The ammeter is compensated against variations in room temperature, and has a so-called suppressed zero point in order to make bet-

ter use of the scale, but only masses as is permissible in regard to constant. For this reason, the zero adjuster "Crelosed by a cover and must be used a if the current is checked, either the suitably equipped laborator, with

standard instrument, or bestill, with a potentiometer. The field of application the Pyro Micro-Optical Pymeter is larger than it appeats first glance. All measuments with glowing wires be made as they are comming the manufacture of incidescent lamps or amplify tubes, and so on, also in locatory work with small nealing and melting furms for metallurgical and cera purposes where thermocourset up difficulties in the standard control of t

Blaner Universal Han Spring Winder

high temperature for chem or physical reasons.

A spring winder with whe springs of various sizes can wound without the aid of machine tool has been pla on the market by the Elaner Co., 631 Meek Sharon, Pa. The winder

made in five different sizes for wing springs as follows: No. 1 Univerto wind springs up to ½-in. diametrom wire from 0 to 18 gauge; No. 2 wind springs up to ¾-in. inside diameter; No. 3, for springs up to 1½-inside diameter from wire up to No gauge or ½-in. diameter; No. 4, to springs up to 1½-in. inside diametrom wire up to ½-in. diameter.

No. 5, for springs up to 1½-in. inside diameter from wire up to ½-in. inside diameter from wire up to ½-in. inside diameter.

M-B "HEAVY DUTY" AIR GRINDER

3 Ranges of Speed 25,000, 45,000 and 65,000 R. P. M.

Streamlined, designed for utmost e a s e of handling and control of air.

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Stages of Power
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Are Your Running Machines Blind?

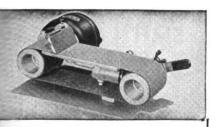
A punch press or any production machine running without a counter is as good as blindfolded. The counter dials are the eyes of the machine, telling the operator every second just where he is. Productimeters save overruns, under-runs, and time lost in hand counting.

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The Homel-M Grinder is sturdily built with a supporting leg under the grinding table to eliminate vibration and tipping due to pressure on the beit. Ball bearing throughout. Equipped with ALEMITE LUBRICATION complete with grease gun.

Write for illustrated folder on this and other styles and sizes.

HORMEL-M GRINDER

WALLS SALES CORP. 96 WARREN ST. NEW YORK, N. Y.

"These MODERN COLLETS Sure Do The Joh"





Take the word of the man on the machine for Modern Cellet performance. Perhaps he won't tell you that Modern Cellets are made of special steel and have a hard long-wearing surface with a tough springy cere . . . that their accuracy in design is

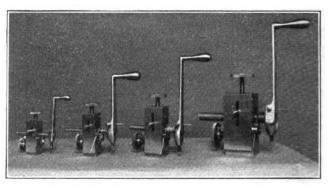
guaranteed . . . that the taper is ground true with the hole . . . er that the deeper, better formed corrugations always give a positive grip.

But it is because of these facts that he can tell you that Modern Collets make his job easier, and more trouble-free. His ewn experience has shown that, by using Modern Collets, locking fingers and shees last lenger, far lese strain is exerted on the chucking cam and chucking cam roller pins, and the work produced is always above criticism. It's the man who sees them in daily use who can really testify to the worth of Modern Collets.

Catalog 33 lists complete information and prices on all perishable parts and tools for all types of screw machines. Write for it today!

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The winder is made from square cold rolled steel, the size depending upon the size of the spring to be wound. Mandrels in a variety of sizes are supplied for winding springs of varying diameters. The tool is of simple design, consisting principally of the body of the tool proper, a mandrel upon which the spring is wound, the V-block in which the mandrel rests, an adjusting screw for providing the necessary tension, and a

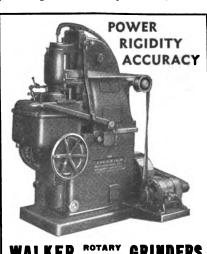
handle by which

volved by hand. To operate, 12 winder is clampe in a bench vis the mandrel placed in position in the winder at tension is applie by means of t adjusting wire is fe between two bra washers and cor nected to the cran handle, nut tightened to app tension to the wire, an adjus ment is made for

and the spring is wound on the mar drel by turning the handle. The tool easily set up and easily operated.

Lake Erie Molding Press

The Lake Eric Engineering Corportion, Buffslo, N. Y., announces a ne Automatic Hydraulic Molding Press for quantity production of molded plast



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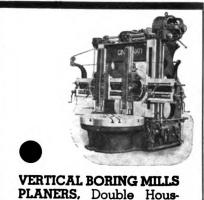


The Type R machine is a combination of three machines — a disc grinder, a polishing wheel, and a belt surfacing machine. Three men can use it at the same time.

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Are the only collets with Diamond-Serrations that grip tighter under less tension and clear themselves of dirt, scale, and chips.

Catalog 12-M

Lists single-piece and master collets for all screw machines. Send for a copy • If your job requires special collets, send work and machine details for quotation on special Diamond-Grip Collets.

SUTTON TOOL CO. 2842 W. Grand Blvd., Detroit, Mich.

and rubber parts at low unit cost. This press is a fast production tilting-head press with automatic multiple ejection of the molded forms. Lake Erie Engineering Corporation builds these presses with either self-contained pump or for accumulator operation.

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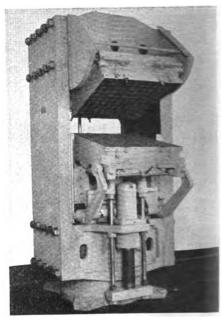
This Lake Erie Molding Press has many applications for molding mechanical molded rubber goods and plastic



WALTHAM THREAD MILLER

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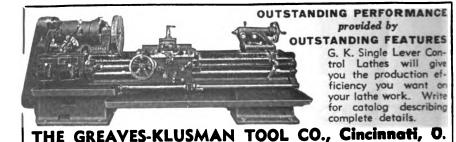


Lake Erie Molding Press

parts such as pedal pads, casters, gear shift knobs, electrical parts and many other similar products in volume production quantities.

Delta Disk Sanders

Designed to meet the needs of both the machine shop, the pattern shop and the cabinet shop, two new disk sanders just announced by the Delta Manufacturing Company, 609 Vienna Ave., Milwaukee, Wis., fill the gap between light

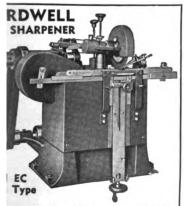




Capacity %" hole

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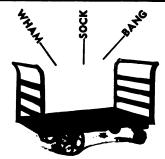


Fig. 754. Pat. Applied For

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machines previously available and the heavy, permanent installation machines.

The new machines are heavy enough for accurate finishing, squaring, mitering, fitting and sanding on wood, metal, plastics and many other materials, yet portable enough to be used throughout the shop wherever they will be most efficient in the machine shop or assembly line.

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odd voltage or frequency motors must be used.

Both machines have 12-in. disks. It by 16-in. tilting tables with graduated sectors for angle of tilt. Tables are pro-



Delta Disk Sander

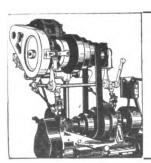
vided with % by %-in. groove for miter gage or for guidance of special fixtures. The shaft of the belt-driven machine !: carried on self-sealed ball bearings, requiring no lubrication.

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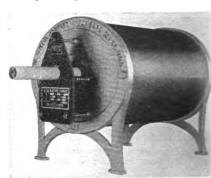
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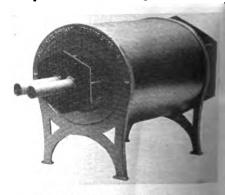
added to extend the line. The performance of the furnace created a demand for a dual tube furnace, which has been added to the Sentry line and is available in several tube sizes.

The air-cooled terminals are retained as they have proven to give many years



Sentry Model V High Temperature Single Tube Combustion Furnace

of trouble-free service without requiring periodical repair or replacement. The high efficiency and low power consumption are outstanding features, the



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the first restriction being made as it leaves the heating chamber. The second reduction is to a size convenient for a rubber tube connection. These restrictions increase furnace efficiency by reducing heat losses around the tube and assure that the end will remain perfectly cool.

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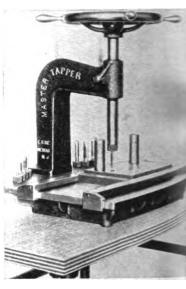
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Master Tapper

gooseneck arm carrying a vertical with an adapter in which the translated and a hand wheel by which spindle and tap may be revolved operate the tapper, the work is loc in position, the spindle is lowered at the tap enters the hole, then the wheel is revolved, threading the into the hole in the usual manner, advantage consists in that the tap

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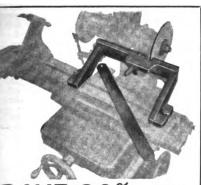
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TOOL COMPANY 2981 Charlevoix Ave. • Detroit held rigidly and is thus prevented from deflecting while being started and the hand wheel can be operated much easier and faster than the ordinary type of tap wrench.

The base is a semi-steel casting, ribbed and seasoned to prevent warping and accurately planed. The working surface is 14x20 in. The spindle is of steel, ground and lapped to a sliding fit in the bushings in which it revolves in the arm. The spindle bushings are of steel, hardened, ground and lapped, and lubricated by means of an Alemite fitting. A spindle lock is provided for



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holding the spindle in position who arranging the parts to be tapped. It joint iff the bracket arm with the has has been scraped so that it will be absolutely wituare with the base is 9 in. The tap is distance from the spindle beater the base is 9 in. The tap is distance from one size to machine changed from one size to machine ers are broached to fit the square that of the tap, thus insuring a position of the tap, thus insuring a position of the tap in the shank of the tap in to fit the spindle. Two sliding parts bars hold the work in place while tap.

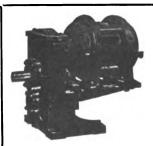
Adapters are supplied in almas to : ¼, Å, ¾, to ½, %, ¾, and ¾ in. Ni or N. F. thread taps. The tapper is supplied complete with eight adapters, in

holding parallels and stand.

Kar Sine Angle Plate

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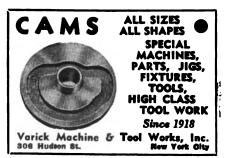
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quickly to within 15 deg. of any desired angle. The notched sector can be rotated over a total travel of 8 deg. by the fine adjustment screw, behind the lower portion of the micrometer. Once set, the device can be locked rigidly by a screw clamp at the rear. These adjustments are conveniently placed at the right side of the front of the device.

The base and movable plate are cast of a special alloy and are normalized to eliminate possibility of warping. The measuring members are of high grade tool steel, hardened, ground and lapped. The entire unit is made accurately to





precision standards. When the a plate is set as required, the disti from the upper surface of the local pins to the lower face of the anvil be equal to the sine or cosine of angle of inclination of the top pla



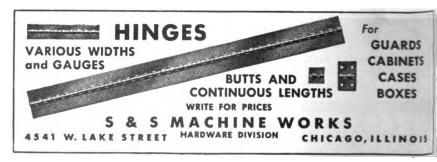
Kar Sine Angle Plate

times one inch. In the illustration measurement over the pin on which the micrometer is shown corresponds to the sine of the angle, while measurement from the other pin will correspond to the cosine.

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solution of vibration problems because the function of velocity is an advantageous base for calculations as it includes the functions of frequency and displacements.

The detector unit of the new vibration velocity meter is a small electrical generator operating on a reciprocating A small coil inside the unit is attached to the end of a projecting contact rod. When the contact rod is held against a vibrating object, an internal coil moves back and forth with the vibration. This coil is arranged to move within a strong magnetic field set up by Alnico permanent magnets. A special mechanical coupling spring between the moving-coil system and the magminimizes netic fleld structure transmission of any vibratory motion to the magnets or to the casing to which The interaction bethey are attached. tween the moving coil and the stationary magnetic field generates a voltage proportional to the rate of motion of the coil, which is the velocity of the vibration. An amplifier unit increases this generated signal to the point where it will operate a small indicating a strument.

A special cradle in which the veloc detector unit can be permaned mounted is available. This type mounting eliminates the errors introduced in reading by the unavoidal jiggling of the observer's hand, and is provides a means of holding the instrument when a permanent record of vibration covering a period of sets hours is desired.

In addition to indicating and recording straight vibration velocity, the streetor unit can be used to obtain obtainformation about vibratory motal wave shape and velocity can be study by impressing the amplified signal of detector on either a cathode-ray magnetic oscillograph. Since a gradeal of information about a vibratic can be obtained through the knowker of its wave shape, this type of scales wide application

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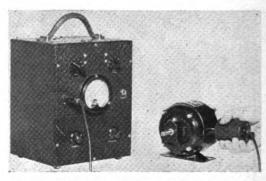


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Vibration velocity detector units have been used on m applications where knowl of vibration characteris wanted. Several detect have been in use vears as vibration detect the bearings of a la Another fie turbine. such velocity detectors been used extensively connection with balance chines. This type of generator has been us some time with both por and permanently installed Still ancing machinery. other application of the is the operation of an al system when the vibratio velocity of a machine exc a predetermined value. In s

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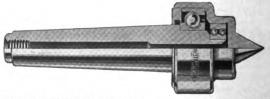
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WESTERN TOOL & MFG. CO.

"Shorty" Ball Bearing Electric Drill

A ball bearing electric drill, available in either 3/16 or 1/4-in. size, the characteristics of which are ample power compact design, light weight and the ability to work "around corners," his been placed on the market by The Black & Decker Mfg. Co., 720 Pennsylvania Ave., Towson, Md. The unit is said to present a new principle of electric drill



"Shorty" Ball Bearing Electric Della

construction. The chuck spindle is mounted at right angles to the motor and reduces the overall working length of the tool to 4½ in. The motor housing dimensions have also been reduced to a minimum, so that the tool first snugly in the operator's hand and requires no extra handle.

An ingenious ventilating arrangement assures cool motor operation. Deep went cast in the gear-head provide for five passage of air, even though the tool is grasped by the head. The tapered end of the gear-head extends over the church thus protecting the operator's fingers.

The unit is ball bearing equipped throughout and has a universal motor which operates on either A.C. or D.C. A removable insulated cap provides access to brushes for inspection. The thumb control switch is in the line is

199

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Send sample or blueprints for estimate to Dept. 1.

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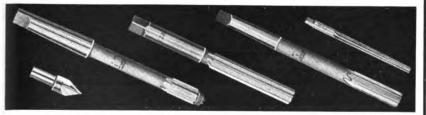
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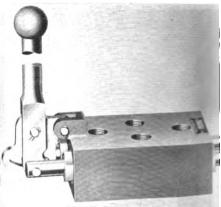
Cleveland... 3346 Superior Avenue Chicago . . . Detroit . . . 11 South Clinton Street 6540 Antoine Street

back of the tool.

The "Shorty" has been especially designed for "close corner" work, as in aircraft and auto-trim plants, radio and other cabinet work, ornamental iron and structural steel work, and as a compact "kit" tool where size and weight are important considerations.

The ¼-in. model operates at 2500 r.p.m. under no-load conditions, and at 1600 r.p.m. under full load. The 3/16-in. model has a no-load speed of 3700 r.p.m. and a full-load speed of 2500 r.p.m. Optional speeds for this model are: no-load, 5000 r.p.m.; full-load, 3200 r.p.m. Net weight of the "Shorty," 3½ lbs.; shipping weight, 4½ lbs. Overall length, 4½ in. in direction of chuck spindle; 4¾ in. in direction of motor.

Standard equipment includes a three-conductor cable and plug, thumb control switch in the line, Jacobs geared chuck and key, universal motor for A.C. or D.C., and a removable bakelite cap to facilitate brush inspection. The drills are built for 110 volts, but are also available for 220 or 250 volts.



Hunt Solid Steel Slab Hydraulie Valve

Hunt Solid Steel Slab Hydrauli Valves

A hydraulic valve, the housing which is machined from a solid salab, has been added to the line

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The "face value" of a Dial Indicator is its ability to give accurate readings at all times—even after continual rough treatment.

The Standard Dial Indicator has a high "face value". Its new Shockproof construction protects delicate mechanism from shocks that would destroy the preci-ion of the average Dial Indicator.

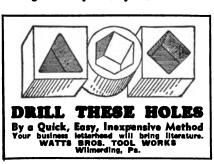
Write for new catalog.

For Better Gaging—Come to "Standard"

STANDARD GAGE CO., INC. POUGHKEEPSIE NEW YORK

valves manufactured by C. B. Hunt & Son's Company, Salem, Ohio. The valves, which are available for 1000 or 2000 lbs. working pressure, are made in two-way, three-way and four-way types. The three-way and four-way valves have only two internal parts for valving action which operate to completely eliminate metal-to-metal wear. The valves can be furnished in sizes from ½ to 1½ inches.

The units are designed so that piping connections may be made either above or below. Piping connections need not be disturbed for inspection. The entire valving assembly and cylinder or lever-





The new adjustable hexagon die saves time—saves wear on die—prevents torn threads. Use any nut wrench.

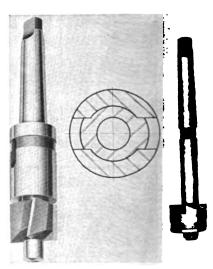
Jammed threads made good as new—no crossed threads—perfect alignment. Write for bulletin.

Threadwell Tap & Die Co.
GREENFIELD MASS.

age can be removed and replaced in a few minutes. Valves are tested for an extremes possible for their working presure ratings.

National Spline Taper Drive Counterbore and Spline Drive Inverted Spotfacer

A new line of Heavy Duty Counterbores, known as Spline Taper Driz Counterbores, is now announced by the National Twist Drill & Tool Co., Detou.



National Spline Taper Drive Counterbore and Spline Drive Inverted Spotfacer

Mich. This new design combines exceptional ruggedness of the drive, as well as of the tool itself, with permanent alignment of the counterbore cutter with the sholder. Simplicity of design has been achieved to an exceptional degree at there are no loose pieces such as acrespins or springs. The cross sections drawing of the drive part of the shant indicates how strength has been combined with room for a pilot of amperproportions.

Hardened and ground alloy steel holders have been developed with the lot of long life and continued accurate Each holder will accommodate a serie of cutters within its range. Interchangeability of pilots has also been arranged for in the same way.

The Spline Drive Inverted Spotfacen



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BY USING Cerrobend (Woods Metal) as a filler, many shops are making substantial savings in the bending of thin-walled metal tubing. An alloy of pismuth, lead, tin and cadmium, it melts at 160° F. (less than the temperature of poiling water). Expands slightly on solidifying, thus filling tube completely md leaving no unsupported spots to cause trouble. Used also for bending metal nouldings and other open sections.

Approximate weight of Cerrobend per foot of tubing for various inside diameters:

3/4"-----1.83 lbs. 1/4"______.22 lbs. 11/4"_____ 7.39 lbs. 1/4"______ .83 lbs. 1" _____3.25 lbs. 2" _____13.16 lbs.

Other low-temperature-melting alloys useful in a wide variety of metal-working operations are also available. Send for literature.

CERRO DE PASCO COPPER CORPORATIO

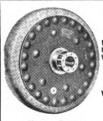
44 WALL STREET NEW YORK, N. Y.

Sritish Associates: Mining and Chemical Products, Ltd., London, England.

also announced are companion tools to the counterbores described above. These inverted tools are useful for spotfacing or counterboring surfaces that are inaccessibly located. The pilot is inserted through a hole and the cutter can be attached by a small angular movement. Driving is accomplished by means of three splines, located 120 deg. apart. These splines are integral with the pilot. Corresponding spline surfaces are provided on the cutter so that a thoroughly balanced three-point drive results.

Standard sizes of these tools are carried in stock. Special combinations of Spline Taper Drive tools can be ar-

ranged.



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Do the Job right with
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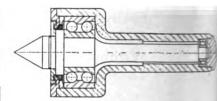


SAVE MONEY by outlasting several can't split — can't work loose and are safe to use. Write for free sample.

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"Red-E" Ball Bearing Center

The cross-section drawing presented herewith illustrates the design of a new ball bearing tallstock center which he been placed on the market by The Bearing Tool Company, Bridgeport, Command this tool the spindle center is mounted.

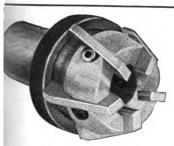


"Red-E" Ball Bearing Center

on two bearings; a double row preloads angular contact precision bearing in the front, to provide rigidity, both radial an axial, and a single row self-aligning roller bearing in the back to act as stabilizer and provide maximum radial load capacity. The spindle is of unusually large diameter to prevent defeation at the center point.

The possibility of dirt, chips or cutting compound getting into the bearing an leakage of lubricant is prevented by use of a complete labyrinth seal will the same woven felt washers that used in other "Red-E" centers. Bot bearings are lubricated with special mi grease for the life of the bearing. To center is rotated from the rear after assembly on the two bearings of which is preloaded and the porground as the last operation so that center will run true and in perfect aller ment with the holder and the axis All parts are of alloy stell the spindle. with exceedingly close tolerances, and are designed for heavy duty and lon service.





ENESEE ADJUSTABLE HOLLOW MILLS

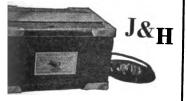
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"Speedmaster" Wide Range Variable Speed Transmission

A transmission unit designed to provide a wide range of speeds has been placed on the market by the Speedmaster Company, 1301 Washington Avenue S., Minneapolis, Minn. The unit employs standard "V" belts which run over adjustable bakelite pulleys, making possible an unusually great variation in the number of speeds available. For example, in the unit illustrated, the output shaft runs at 90 rp.m. at the slow speed and 4300 r.p.m. at the high speed.

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DANLY DIE MAKERS'

This is a ratio of over 45 to 1. The extremely wide ratio is accomplished a relatively small, compact unit.

a relatively small, compact unit.

Another important provision is the alignment between the pulleys abelts is automatically maintains throughout the entire range of a variable speed ratio adjustment.



Speedmaster Wide Range Variable Speedmaster Transmission

fact that the "V" belts run over sefaced bakelite pulleys is another ture assuring maximum belt life standard makes of belts are adapt in this transmission making it is and inexpensive for belt replacement.

A hand wheel on the cabinet come a toggle lever of the pulleys for the ing speeds. There is a speed individual to the unit and the day placed in a convenient position for reading. This instrument is an arrate motor to show the exact speed which the output shaft is running any moment. The output shaft may coupled directly to the product that to be driven; or a "V" belt may be on the pulley as shown in position the output shaft in the illustrate The unit is completely contained. Speedmaster unit is highly efficient substantially trouble-free.

The unit shown has a ½ hp. mounted on the top of the unit. Beever, the motor may be mounted various positions on the housing.

SAVE SPACE

 These man-height Handlest Bar Racks used singly or doubly, eccupy very little floor space and have a great capacity.

Other methods require four times the floor space for the capacity. Low in Price.

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It will:

Keep your grinding wheels accurate and fast cutting.

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5 3/4 "x13" size

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Waterproof for wet or dry grinding
A REAL MAGNETIC CHUCK that is adaptable for any
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Have connections to operate on either 110 or 220 volta
direct current. Well designed and beautifully finished,
highest quality workmanship throughout—complete
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Also made in the following sizes: 6 % "x18"—860. 8"x24"
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pounds. Takes the magnetism out of work that has become magnetized through induction. A single pass over the stationary poles is sufficient to demagnetize the work completely. Also Model J-1—7 ¼ " wide, 7 ¼ " long, 6 ¼ " high. Shipping weight, 35 lbs. \$45.

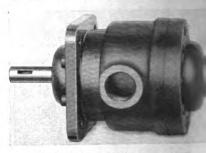
20 N. ST. CLAIR ST. TOLEDO, OHIO be mounted inside so that the entire unit may be used to form a base or leg of the machine it drives. The Speedmaster is available in various sizes, and the company is equipped to engineer special designs for specific applications.

While the unit has a ratio of over 45 to 1 it is not necessary to confine the use of the "Speedmaster" to extremely wide range applications. It may be used equally well transmitting power where only a small portion of the ratio is needed. This device is used very successfully in such machines as the Doall

which "Speedin Contour Machine, master" is standard equipment.

Multi-Piston High-Pressure Pump

Hydraulic Detroit Pump Corporation 533 Orleans St., Detroit, Mich., is not offering a multi-piston high-pressure pump which is said to have the sivantages of economy in power consump-



Multi-Piston High-Pressure Pump

tion, uniform flow with no pulsation constant volume at all pressures, volu-

metric efficiency under fluctuating presure, and compactness.

The design is such that the piston are mounted in a circle parallel to the drive shaft, permitting a large area of piston displacement within a companious and securing the high volument of piston action. The operating methods in a mounted in hell and the piston action. The operating the high positive displacement of piston action. The operating the mounted in hell and the piston action. mechanism is mounted in ball and needle bearings, and is self-lubricating throughout. Flange or pedestal mount ings can be used and mountings are interchangeable. Power is supplied by drect motor drive, either right or less hand rotation. The pump is built in two sizes with a capacity range of 3 to 36 gal. per minute. Delivery is directly proportional to horsepower and speed



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It's cheaper to PREVENT belt-shifting accidents than to pay for them after they have happened.

The RED-E Belt Stick cannot catch— prevents belt shifting accidents. Write for catalog and prices.

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cial sizes.

Special trucks designed and built for every requirement.

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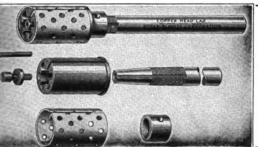
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Getting all the holes in fender at once.

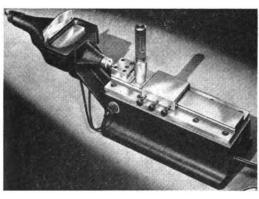
- 75% salvagable for next year.
- 5. Costs comparable with die costs.
- 6. Elimination of costly cam dies.

D-WEST PRODUCTION ENGINEERING, Inc. 1421 E. MILWAUKEE

Sheffield Checking Instrument for Tapered Plug Gages

210

The troublesome human factor and difficulty of alignment has definitely been removed from tapered plug gage inspection by a visual type checking device announced by the Sheffield Cage Corporation, Dayton, Ohio. The instrument used to check the small diameter of the taper has a plain horizontal bed.



Sheffield Checking Instrument for Tapered Plug Gages

On one end of this bed is an adjustable anvil, at the other a visual gage head. This head incorporates the Sheffield Reed Mechanism which entirely avoids the use of gears, levers, knife edges, or any element which operates under sliding contact. It is not vulnerable to wear or to loss of adjustment due to wear.

In checking the small diameter of a tapered gage on this device, precision gage blocks equivalent to the true diameter of the small end of the taper are

stacked on the horizontal bed between the adjustable anvil and the gaging exment. A standard gage roll is then place tangent to each end of this stack and the adjustable anvil moved up so as a bring the blocks and rolls into contain with the gaging element. Just sufficient pressure is developed by the fine adjustment of the gage to place in shadow on the visual dial face at zero

The actual small diameter of the ga

is read directly by substitution it for the stack of blocks. To shadow on the dial face indicates exactly how much in diameter is under size or or size. The value of the tag angle of the plugs is determined by using a standar visual gage in conjunctativith a master angle block.

The master angle block is wedge shaped block used a fixture to hold the tapered property of the anyll of the visual gap. The angle between the based the hypotenuse of it wedge is equal to the entincluded angle of the tape. Thus with the tapered property of tapered p

Setting the visual gage i zero at a point on the smi

has already been checked, the pla and block are slid longitudinally at der the spindle of the visual gage at til the large end is reached. Thus at variation in true taper is read direct on the visual gage dial. If the shadr remains on zero from one end of a plug gage to the other, the taper is or rect.

These master angle blocks are and able for all standard tapers. Any special taper can, of course, be provided for an made to specifications.



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PROGRESSIVE TOOL & CUTTER CO. FERNDALE • MICHIGAN

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Packless Self-Flaring Tube Coupling

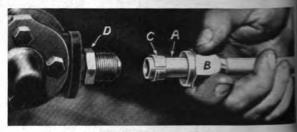
Packless Metal Products Corporation, Long Island City, N. Y., has brought out a tube coupling so designed that a perfect seat with a uniform walled flare is obtained in assembling the coupling.

No flaring tools are required, no soldering, and no brazing. operation of assembling the coupling forms the flare and locks it securely. The union thus effected eliminates tube distortion, cracking or split ends.

To assemble a tube by the use of this coupling, the connector D is screwed into the assembly in the usual manner.

The swivel nut B is now slipped over the end of the tubing, indicated as A. The feature of the coupling is the slip split ring C (which forms the flare as connector D is screwed into the fitting, and gives added protection to the flare

at the critical vibration point). Swim nut B is recessed deep enough to the the split ring C and have a few thin projecting over to engage the thresh connector D. The end of the tube applied to the seat on connector D E swivel nut B is screwed into place. the swivel nut B is threaded on,



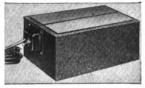
Packless Self-Flaring Coupling

ring C is locked tightly around the I and the end of the tubing is forced ! the seat on the end of connector flaring the end of the tubing. Sw nut B is threaded on until a full f is made, when swivel nut B will be t on its thread. The operation is simply quick and easy, and the positive, meta to-metal contact provides a joint that strong, substantial and is said to remi leak-proof.

No flaring tools are required and coupling can be installed in close queters without the slightest inconvenient. The tubing need be moved only as distance in order to connect or be the coupling. Short bends are assembled without springing or dist ing the tubing. The couplings can used repeatedly with new tubing.

Packless Self-Flaring Tube Cour are sized according to the outside di eter and maximum wall thickness of tube for which they are to be u

Now! DEMAGNETIZER



Chicago

Operates on 60 cycle 110 volt AC 8 3/4 "x11" x5 1/2". Wt. 55 lbs. Comes

complete ready to use. Absolute tool room sity. FULLY GUARANTEED. Order today. VITAVOX COMPANY

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The HJORTH Perfection Spring Winder offers the ideal means of winding extension, compression, torsion, taper, double taper, or left hand springs. Try one in your shop. You'll like it and the price is reasonable.

HJORTH LATHE TOOL CO. 12 BEACON STREET WOBURN, MASS.

bing of any wall thickness can be ed with each fitting up to the maxi-im listed on the data sheet for each ing. Fittings are available for tubing extra heavy wall thickness.

I.P.S. standard threads. gs are regularly supplied in brass or onze. If desired in any other metal, ch material should be specified.

Lathetule

Semi-turret lathe operation on an ene lathe is possible with the Lathee. illustrated herewith. This tool, cduct of H. J. Fausnaugh, 1022 N. In St., Three Rivers, Mich., consists a quick acting positive clamping fixe which replaces the tool post.

Special tool holders are used, one for the constation.

ch operation. They are positively ated in the Lathetule with a locating vice by which the tool holders are vays replaced in exactly the same posi-By noting the graduation readings n. n. By noting the graduation resultings each operation, succeeding pieces by be run without measuring. To do is the cross slide is merely returned the graduation reading of the subsection.

To change tool holders, the hand



"Lathetule" in position

wheel is released about one-third turn and flipped to the right, the tool holder is removed and replaced with the one required. The hand wheel is then returned and tightened.

Time savings of thirty-five per cent have been effected on the part shown in

the illustration.



FlexoiD INDUSTRIAL COUPLINGS

Have no Back-lash Never Become Noisy Operate Horizontally or Vertically Absorb All Vibration, Shocks and Jolts Require No Lubrication

Special molded Thermoid coupling discs act as cushions and are impervious to oil and water. FLEXOID couplings have no metal-to-metal bearing surfaces and can be used successfully on reversing drives because there is no lost motion.

A leaslet describing this coupling is available on request.

Flexoid Coupling Co.

Division of

THE SMITH POWER TRANSMISSION CO.

CLEVELAND, OHIO

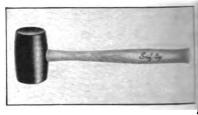
"Saf-ty" Mallets

Martin Bersted Company, 20 E. Jackson Blvd., Chicago, Ill., is now market-ing a "Saf-ty" Mallet of a molded composition which enables the manufacturer to furnish a mallet of a single size in a variety of weights and hardnesses. The mallet is made of a special solid composition, molded to shape, and heat treated after molding. The mallet is available in four sizes designated as No. 1, 2, 3 and 4, the head sizes of which are 1-in. diameter by 21/2 in., 11/2-in. diameter by 3 in., 2-in. diameter by 31/4 in.. and 214-in. diameter by 414 in. length.



OIL CUPS and Oil Hole Covers for All Types of Ma-chines and Machine Tools.
Made From Brass Rod
With Die Out Threads.
Special Oflers Made To
Order. Flush type drives in Write for Catalog. W. W. & C. F. TUCKER, Inc. e22 Capitol Avenue Hartford, Conn. "Established 1899"

The No. 1 and 2 sizes are available in two different weights and the No. 3 4 sizes are made in four differ Thus the mallet can be he weights. in four different sizes, with four different ent handle lengths, but in 12 different weights and hardnesses according to the work upon which it is to be used. The



"Saf-ty" Mallet

mallet is not loaded, and no metal para It is perfectly balanced. are used. tough and durable, will not flare, or become spongy, is oil and water-product is a perfect insulator for electricity. resists reasonably strong acids.

Landis 3ALM Receding Chase Collapsible Tap

The Landis Machine Compasi Waynesboro, Pa., announces an addition to the well-known line of Landis Callapsible and Receding Chaser Collapsible Taps. The Landis SALM is a second of the receding-chaser type and poss ses a number of features that greatly is crease the efficiency of its perform both in the accuracy of the them produces and in the length of 3 the chaser between grinds. The top of high carbon steel and all parts heat treated and ground. All surious with sliding contacts are hardened.

The SALM Tap, designed primarily for the salah treated to the salah treated treated to the salah treated tr



Wade Metal Shop

Envelope

Strong, non-inflammable, non-rusting, handy. Front fastens at bottom, but removes readily to clean. Papers easily inserted. Hang on hook or place in tote pan. for low prices.

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Mr. Chief Draftsman We can supply tracing sheets with company name. block, trade mark and printed border less than the actual expense of hapharand handlettering and rol ing. Ask for samples.

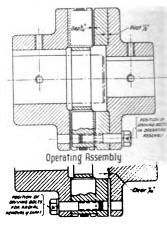
Lovejoy Type WQ Flexible Coupling

A flexible coupling known as the L-R Type WQ, which has one set of jaws made in the form of a removable ring, has been placed on the market by Love-joy Flexible Coupling Company, 5007 W. Lake St., Chicago, Ill. The ring is held in place and driven by 3, 5, 7 or 9 hexagon head alloy steel cap screws which operate from the jaw body.

Due to the fact that the pilot which holds the jaw ring in place is ½ in. deep, while the gap between the cush ions and the jaw body is 3/16 in., when the removable jaw ring is pulled over a



clearance of 1/16 in. develops, which is ample for rotating either half of the coupling. According to the manufacturer, this independent rotation is most valuable on such jobs as gasoline, seen and Diesel engines, where it is necessarity on the coupling of the coupling



L-R Type WQ Flexible Coupling

IDEAL SPEED LATHES



FOR LAPPING FINISHING POLISHING SMALL PARTS

2 Speed Motor.
Automatic Brake.
Collet or 3 Jaw
Chucks. Hand
operated or automatic. Write for
Cir. 351.

SCHAUER MACHINE CO.

905-7 Broadway

Cincinnati, Ohio

be done with the machinery connect. The disconnecting is accomplished without moving the load cushions or retaining band, the only adjusted necessary being the removal and rever of the cap screws so that they open from the other body.

Three types of cushions are used the L-R Type WQ Couplings. Meta's a high grade, long-wearing brake immaterial, is used where heavy so loads develop, such as on excusjobs, with steel mill equipment and machines exposed to severe wear Leather load cushions of high qui



k-tanned belting leather are used on stained loads and greater misalignent. Muitifiex, a rubber duck fabric loanized under pressure, is employed here loads fluctuate considerably and aximum resiliency is important. These couplings are designed on the

R principle of carrying a load on se floating load cushious. It is said at by the application of suitable marials and proper design, it is possible increase capacities materially without by change in overall dimensions. The uplings permit easy correction of misgrament on even the heaviest mainery and operate to reduce depreation because the give-and-take action the resilient material used absorbs reque and shocks and compensates for reduce and shocks and compensates for rerload. No lubrication is necessary id, as there are no metal-to-metal concess, L-R Couplings are said to be actically everlasting. Cushions on the pe WQ Couplings are free floating between the metal jaws; that is, the inral end rests on the hub. The cushins, which are retained in place by a seel band, are free to move and adjust startly to any momentary position of e jaws. In operation, one-half of the shions are idlers (except on reversing ads), hence there is always a set of the unions are readily accessible and in see of readjustment, they can be lifted to and interchanged without tearing

bwn the coupling.

L-R Type WQ Flexible Couplings are
ade in standard sizes with bores from
4 to 14 in, (2 to 2000 h.p. at 100

ō.m.).

Telebrineller

A light weight, portable Brinell inrument that can be carried easily right
the job so that metal hardness
sts can be made in the field, to be
nown as the Telebrineller, has been
eveloped by Teleweld, Inc., Railway
schange Bidg., Chicago, Ill. According
the manufacturer, it can be used in
one quarters and can be applied to
arts and equipment the size of which
ave, heretofore, made testing difficult,
tpensive and sometimes virtually impossible. It eliminates both the necesty of dismantling equipment to be
steed and transporting specimens to the
boratory.

The instrument was developed to neck and control the re-building (weldig) and heat treating of rail ends on the right-of-way. Its simplicity, continues and the ease with which it can be carried are indicated by the fact that the combined weight of the outfit and arrying case is only 6½ lbs. According



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Pumps for —
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Hydraulic Systems
Forced Feed Lubrication
Maintaining Pressure
General Circulation

—It will pay you to keep a copy at hand.

Write now—Brown & Sharpe Mfg. Co., Providence, R. I.

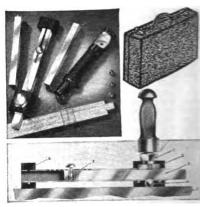


BROWN & SHARPE PUMPS

to the manufacturer, it is not affected by hot or cold weather and is built to stand hard use. No training or previous experience, it is claimed, is necessary to operate it accurately.

In addition to its more obvious uses for checking raw materials with speci-fications and in routine production control, it also has a number of uses in plant maintenance work. For instance, it is being used wherever an accurate knowledge of metal hardness is a factor in safety and continuous operation.

The outfit is composed of the Telebrineller instrument proper, a bar of known hardness, a microscope with a scale etched in its focal plane and a slide rule, packed with extra test har and impression balls in a small case. The instrument itself consists of a meta.



Telebrineller

M-D Facing Heads With Automatic Feed Can be attached to Column Boring Bar, and Drilling or Milling Machine spindles. Single point tool travels radially, from center out-ward or reverse, feeds auto-matically and covers faces 6" to 30".

Write for circular.

MUMMERT-DIXON 120 Philadelphia St. Hanover, Pa.

GEARS **Good Gears Only** All Kinds **Any Quantity** At the Right Price

THE CINCINNATI GEAR CO. 1825 READING ROAD, CINCINNATI, OHIO tube supported in a soft rubber hea-(2) and a rubber spacing block (6) the tube holding the bar of known hardness (3). An anvil (1) in the top the rubber head rests directly on the bar. Below the bar an impression be (4), secured in a narrow aperture in base of the head, comes in direct contact with the metal to be tested. The spacing bar (7) holds the bar in a clear area for each test.

To make a test the instrument is he against the specimen and the anvil struck a sharp blow with a 3 to 5-h hammer. The impact is transmitted through the anvil to the bar, then the ball and on to the specimen. of the blow is said not to be a factor the diameter of the impression in the

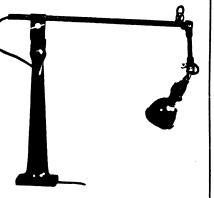


ar and in the specimen being, in any se, relative to their individual Brinell ardness number (BHN).

The diameters of the impressions are en measured in 1/10 millimeters by acing the microscope over each in turn d reading the scale. Figuring the IN is then a simple matter, using ther an arithmetical formula or the de rule.

Fostoria No. 71 and 72 Table Lamps

The Fostoria Localite Lamp illustrated s been brought out by The Fostoria essed Steel Corporation, Fostoria, Corporation, nio, to meet the demand for a thor-ghly fool-proof and universal lighting lit for attachment to machines and



Fostoria No. 72 Table Lamp

bles. The type of construction emoyed combines complete flexibility with e rigidity necessary to reduce vibra-

n to the minimum

scientifically-designed The commodates the standard double conct candelabra bayonet base type of mp in either the 6-8 volt or 110-115 classification. Thus, no nat type of circuit is used, the new storia unit can be utilized without ficulty to provide the desired quantity d quality of illumination as quickly d as easily as pointing a finger.

The No. 71 is especially intended for tachment to a bracket. The horizontal tachment to a bracket. The horizontal m is 15 in. long and includes a fric-no swivel joint as illustrated. The xiliary arm is 5½ in. long. Overall agth, including the reflector, is 26½ Equipped with a standard Under-

New RIDID Saves 75% of Your Pipe Wrench Repairs

Seen the new RID Wrench? Stronger, safer—thicker special alloy metal in the guaranteed housing, improved design. Chrome molybdenum alloy safety jaws and alloy handle — practically ends broken wrench expense.

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has millions of users. Replaceiaws slipand - lock - proof. Adjusting nut spins easily in all sizes, 6" to 60".

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Saves Man-Power Compound - Leverage makes one man strong as six—itself quickly in salvaged fittings. Wrench



The bori-

Ph



GEARS IN STOCK Immediate Belivery Gears, speed reducers, thrust bearsprockets. ings. Sezible complings. pulleys, etc. A complete line is carried in our Chicago stock. Can also quote on special gears of any kind. Send us your blue prints and inguiries. Write for Catalog No. 80

WORKS GEAR CHICAGO Chicago, III. 769-778 W. Jackson Blvd.,

The No. 72 is designed for attachment to a machine bed or bench. zontal arm is 22 in. long and is mounted on a cast iron base 14 in. high. Auriliary arm is 5½ in. long. Overall length. including reflector assembly, 83 1 in with standard Underwitters Equipped approved cord and rubber plug. is smooth machine tool gray, with black or green optional. Transformers are necessary in the 6-8 volt type of installation.

Wade Shop Envelope

writers approved cord and rubber plug

For use in handling shop orders, recording sheets, and blue prints through Wade Instrument Comthe shop, the Wade Instrument Com-pany, 1663-A East 118 St., Cleveland

pany, Ohio, has brought out an envelope especially designed for this service. The envelope has a stiff metal back that is rust resisting, and a non-inthick flammable, transparent Lumarith Shop front. prints, orders, cards, and so on, be read can without removing from the envelope.



Wade Shop Envelope

A flare at the top stiffens the Lun arith and allows papers to slide in an Two pressed spots at out freely. bottom hold the Lumarith in place, b it can easily be removed for cleaning and All edges have been bevel replaced. for safety. The envelope is made in the stock sizes of 6 x 9, 9 x12, and 12 x 11 in., but any size or shape can be supplied to order.

Portable Electro-Rectifier for Magnetic Chucks

It has been common practice in machine shops to use motor generates as a supply of direct current of mar-As these generators need netic chucks. periodic repair due to brush wear, besings and other general mechanical culties, it is necessary to have the direct current supply out of operation for eral hours while these repairs are ben made or while a substitute general is being installed.

Recently, the Electronic Control operation developed a rectifier especial The Grin built for magnetic chucks.





our taps and be convinced of the lower cost per tapped hole. We specialize in quality and prompt service. Write for Catalog Discount Sheet.

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A Real Beauty, you will say when you seit. But Gerstner Chests are also built to serve you many years in protecting good tools from loss and damage.

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TOOL CHESTS

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You save the cost of drilling rings, bushings, etc., when you order BISCO Tool Steef Tubing. The ho'es are FREE. Sizes up to 14" diameter.

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2 MONEY SAVERS

in your shop

The VICTOR Super Drill

You get five changes of speed (1600 to 4250 R. P. M.) without



Plates

stopping the machine or touching the belt. You simply open or close the patented conical pulley in the Wonder Chamber to regulate the R. P. M. of the spindle. Saves time—saves money.

BOSTON Universal Angle

Here's an accurate tool used on drill presses, milling machines, grinders, planers and shapers. Graduated to 360° horizontally and 120° vertically with vernier adjustments. Eliminates costly fixtures and increases production.

Write for circulars and prices.

U.S. AUTOMATIC BOX MACHINERY CO., INC. 459 WATERTOWN ST., BOSTON, MASS. ing Machinery Company, 2832 E. Grand Boulevard, Detroit, Mich., are exclusive distributors for this unusual product. Portable rectifiers are now available for use in plants where it is necessary to transfer the magnetic chuck to some other location in the plant where direct current is not available.

standard Electro-Rectifier uses The radio tubes and furnishes a very economical means of obtaining direct cur-rent from the Standard 115 volt, 50 or cycle lighting line. The rectifier comes complete with a suitable convenience cord so that it may be readily plugged into the ordinary convenience A female hubble cap is also outlet. provided so that the chuck may be plugged directly into the direct cur-



6 lb. Portable Electro-Rectifier for Magnet

USE LAYOUT FLUID

for general machine shop and tool room use on dies, jigs, fix-tures, and machined parts.
With the use of the die blue layout fluid,

do not have to you do not nave to polish the surface of work. Simply wips surface fairly clean and brush on. DRIES IN-STANTLY.

Write for free shop sample on your letterhead.

DAYTON ROGERS MFG. CO. MINNEAPOLIS, MINN.

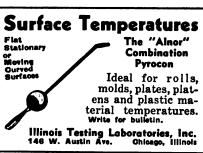
rent output of this recifier. An anad-off switch is mounted on the free panel of the rugged metal housing containing the transformer and rectify tubes. The complete cabinet is finish in optical crystalline enamel 914 in. loc 7 in. high, 5 in. wide, and is equippe with mounting tabs for suitable attachment to the side of a grinder or or

The use of standard radio tubes mar possible economical replacements imm diately in the most remote communication from a standard radio store. The tubes have an expected life of 1.5 hours when used in this newly develop The standard rectifier is so rectifier. plied with 115-volt, 50 or 60 cycle in and 110 volt direct current output. wave at one-half ampere. Rectifiers various alternating current input various alternating current input values and greater direct current output can be built according to specification A pilot light is provided to notify operator that tube fatigue has occurand the chuck is no longer magnets





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THE NEWEST DEVELOPMENT IN

Chicago, III.

METAL CUTTING MACHINES

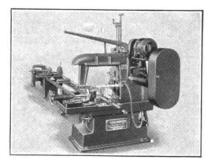
FULL AUTOMATIC-CAPACITY 10"x10" & 6"x6"

Stops when desired number of pieces have been cut. Length of cut is gauged by scale without end stop. Swivels on base for angular cutting.

Also built for manual operation.

RASMUSSEN MACHINE CO.

RACINE, WIS.



Send for circulars giving complete information.

The distributor will recommend the best type of rectifier suitable for use with the specific chuck, and if necessary, will design special installations to meet exacting requirements.

New Literature

Armature Winding. By David P. Moreton, Carl H. Dunlap and L. R. Drinkall. 280 pages, 246 illustrations. American Technical Society, Drexel Ave. at 58th St., Chicago, Ill. Price, \$2.00.

This popular book, comprising a practical treatise on the construction, winding and repairing of alternate current and direct current motors and generators, has been revised and enlarged. Eighty-six new pages have been added, making it an up-to-date, authentic and clearly-written volume on the construction, winding and repairing of A.C. and D.C. motors and generators with practical connection diagrams. The volume is especially adapted for school classroom use, school and public libraries, and for home study and reference work. The illustrations include both line drawings and photographs showing exactly how the work should be done.

The text takes up in turn the Types of A.C. Generators; Phase, Power Factor, Types of Windings, Construction of Alternators, Diesel Engine Generators, Turbo-Generators, Motor Generators. Types of A.C. Motors; Speeds, Single Phase Motors, Repulsion-Start Induction-Run Motors, Classification of Fractional Horsepower Motors, Polyphase Motors, Types of Armatures, Armature Construction, Commutator and Brush Construction, D.C. Motors; Ring Armatures, Drum Armatures, Repairing Mechanical Parts of the Motor, Repairing Field Coils, Armatures, and Commuta-A.C. tors. A.C. Motors; Magnetic Fields, Types of Coils, Winding Single Phase Motors, Winding Polyphase Induction Motors, Winding A.C. Generators, Tesing Windings, Locating Motor Troubles Repairing Windings. Connection Digrams for Induction Motors.

The book is bound in water-proof cloth and is completely indexed.

Thermodynamics. By Stanton E. Winston. 178 pages, 29 illustrations. American Technical Society. Dress. Ave. at 58th St., Chicago, Ill. Price. \$1.50.

In this book the author presents a new and practical text covering the fundamentals of thermodynamics. He has succeeded in presenting the more general principles of engineering dynamics in a clear and easy-to-understand manner. In an effort to make the book a clear as possible, the more complicated processes have been eliminated and calculus has been avoided complete. This, in a few instances, has necessitate the inclusion of a formula for which no derivation is given.

Beginning with the Fundamental Principles, the text explains in turn the Laws of Ideal Gases—Joule's Law. Boyle's Law, Charles' Law, Avogadro's Law and Dalton's Law. Following the principles, the author explains Thermodynamic Processes for Ideal Gases, Constant Volume and Pressure, Isothermal Adiabatic, Polytropic. A section is devoted to Heat-Engine Cycles and the principles and formulas of Carnot, Lenoir, Joule or Brayton, Otto, and Desare presented. The book closes with chapter on Vapors.

Tarnish-Proof Lacquer No. 4527, a high mar-resistant finish for brass and silve is the subject of a product summer issued by Roxalin Flexible Lacquer Ca. Inc., Elizabeth, N. J. The lacquer, which is of the cellulose, air-drying flexible type, is available for spraying and drping. Copy free upon request.



JUST OUT!

BULLETIN A

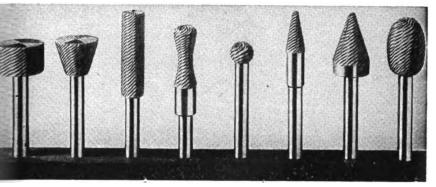
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"GUSHER" PUMPS give Quiet, Economical and Uninterrupted Service

The ball bearing design of the Ruthman "GUSHER" Pump minimizes friction and increases efficiency — to give you maximum service.

A "GUSHER" pump needs no priming and has no foot valves or metal contacts.

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atlas

Ford High Speed Hand Cut Rotary Files in a wide variety of shapes and sizes are described and illustrated in a six-page folder which can be had by addressing M. A. Ford Mfg. Co., 417 Pershing Ave., Davenport, Iowa. The different styles are listed by number, simplifying the task of ordering. Specifications and prices are included. Copy free upon request.

Industrial Cut Gears Catalog No. 100. This 28-page booklet lists complete specifications for the various types of Industrial Cut Gears manufactured by Industrial Gear Manufacturing Co., 2311 W. Fullerton Ave., Chicago, Ill. The line includes cast iron and steel spur gears, cut spur gears, bakelite spur gears, rawhide spur gears, Fabroll spur gears, cut worm gears and worms, and spiral gears. A page is devoted to tables of engineering data on gear wheels and spur gears. Copy free upon request.

Wheelco Capacitrol. Bulletin No. 602, now being distributed by Wheelco Instruments Co. 1929 S. Halsted St., Chicago, Ill., presents the Wheelco Capacit

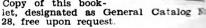
Everyone recognizes
'fever' but the important thing is exactly the same with heat treating, metal melting, and tempering. Gueswork is certain to fall sometime. Know your temperatures. End needless waste, and excessive spollage with a Hold-Heet Pyrometer.

RUSSELL ELECTRIC CO.
338 W. Huron, Chicago, U.S.A.
Shipped prepaid to rated firms on thirty days approval.

trol, a feature of which is close, accarate temperature control. The different models are illustrated by means of patographs and drawings, and the text escribes the instrument in detail. On page is devoted to a display of Capactrol applications in various industraplants. Copy free upon request.

Atlas Equipment Catolog for 1328 Atlas lathes, drill presses, arbor presses and shapers are illustrated and described

in this catalog which has been issued by Atlas Press 1046 Company, Pitcher St., Kalamazoo, Mich. Two readditions cent Atlas line are introduced—a shaper with 7-in, stroke, and a back-geared screw-cutting lathe with 6-in. wing. Copy of this book-



Bridgeport High Speed Milling Matachments, product of The Bridgepor Pattern and Model Works, 52 Remer S. Bridgeport, Conn., are described and lustrated in an eight-page folder, printed in color, which has been issued by the firm. A list of the basic features of these milling attachments is included Descriptions and installation photographs of the Bridgeport ¼ H.P. Milling Attachment, ½ H.P. Milling Attachment and the "Master" Milling, Drilling and Boring Attachment are presented, to gether with the line of adapters, collets and adapter sleeves also made by this company. A table of speeds recommended for high speed end mills from 1/16 to 1 in. in diameter is given. Copy of the booklet free upon request.

RAGINE METAL CUTTING MAGHINES

"Standard the World over"

Racine Tool & Machine Co.º Racine, Wis.



Skilsaw Portable Electric Tools. ttractive 54-page catalog, now being istributed by Skilsaw, Inc., 8314 Elston ve., Chicago, Ill., illustrates and decribes the line of portable electric tools ade by this firm for use in production, naintenance and construction ools presented in this booklet include andsaws, drills, grinders, belt sanders, isk sanders, floor sanders and blowers, ogether with numerous accessories. opy free upon request.

"How to Select and Use Wrenches" is ne title of a booklet published by J. (. Williams & Co., 75 Spring St., New ork, N. Y. The booklet contains much

informaelpful ion to guide both he mechanic and he tool buyer, inluding complete ables of the corect wrench open-ngs for U. S., S.A. ., and American tandard Nut and ap Screw sizes. he data on the arious wrench pplications is well llustrated. Copy ree upon request.

Hammond Autonatic Type J Pol-shing & Buffing & Bulletin. **Lachine** his eight - page ircular, now being listributed by Iammond Machinry Builders, Inc., Kalamazoo, Mich., s devoted to the arious models of he Type J Autonatic Polishing nd Buffing Mahine manufacturd by this firm. The bulletin conains illustrations f the machines, ogether with pecification tables. On one page are cictured 49 differnt products finshed on Hammond Automatic Polishng and Buffing Machines, with a ist of parts and he approximate nourly production ate. Copy free.

Snopake

The Skybryte Company of Cleveland, Ohio, has announced a new product—Snopake—to reduce the excessive glare that is experienced during the winter months in buildings adjacent to open fields where large expanses of snow are present.

The product is a pale-green adhesive liquid that can either be brushed or sprayed on the windows. The manufacturers report that it admits over 90 per cent of the light yet reduces it to mellow softly-diffused illumination.

Snopake is applied to the glass and remains on until removed with hot water

and stiff bristle brush.



Eyerson Certified Steels. Booklet now being issued by Joseph T. Ryerson & Son, Inc., Chicago, Ill., explains the advantages of Ryerson Certified Steels and tells how, by making tests from entire heats of alloy steels, this company is able to supply the customer with alloy steels that have been analyzed and tested and can thus provide him with steels that can be guaranteed to meet his specifications. The book explains the system by which each heat which comes within a restricted range is identified by letter symbols and rolled into bars bearing the same symbols, identification letters being stamped on the end of each bar. Thus all bars from a given heat carry identification letters assigned to that heat.

Illustrations include the charts which are supplied to the customer giving the heat analysis identification letter, McQuaid Ehn grain size, cleanliness rating, and also the results of the carburizing test of a standard sample in the case of carburizing steels or curves representing the tensile strength, yield point, elongation, reduction of area, Brinell hardness, and so on, in the case of quenching steels. The complete plan by which the user of steels is enabled to purchase steels of a definite analysis is

outlined. Copy free by addressing Joeph T. Ryerson & Son, Inc., at the above address, or at any of their plants :: Boston, Milwaukee, St. Louis, Cincinnati, Cleveland, Buffalo, Philadelphia Detroit, or Jersey City.

Heil Bulletin No. 42. A new foliar dealing with the methods of heating corosive liquids used in the various process industries, is available upon requestrom Heil & Company, 3088 West 1882 St., Cleveland, Ohio. In addition to the information on Heil steam, gas and extric tank heating equipment, immersize coils, and so on, the folder includes degrams of pipework connection details graphs of heating speeds, and other useful data.

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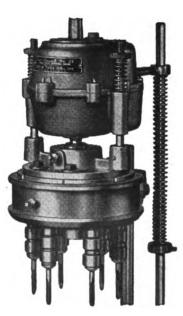
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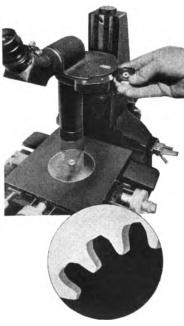
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WORK UP A
SWEAT ON
THAT ONE

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LAST LONG
WITH YOU,
BROTHER

2

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